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ON THE FRESH-WATER SHELL-HEAPS OF THE ST. JOHNS RIVER, EAST FLORIDA.

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The St. Johns River, on the banks of which are to be seen the mounds described in the following pages, has, in several respects, a peculiar interest. It rises near the middle of the eastern half of the peninsula of Florida, in two series of lakes and swamps of great extent, one of which finds its outlet through the upper portion of the main stream, and the other through the Oklawaha, the largest of its tributaries. These waters are separated by land scarcely rising above their level, from another chain of lakes and swamps which have an outlet southwards through the Kissimmee, and thence into the great lake of Okee-Chobee, which has an area of about eight hundred square miles. Other waters, starting from the same region as the preceding, but separated from them by a low range of sand-hills, are discharged westwards into the Gulf of Mexico, chiefly through the Withlokootchee. Though extremely crooked, the general course of the St. Johns is somewhat to the west of north, and in its various windings is supposed to traverse a distance of three hundred miles. Its frequent enlargements, as at Lake Harney, Lake Monroe, Lake George, and its great breadth

from Palatka to its mouth, almost justify the designation of it as a chain of lakes rather than a river. Flowing through a region which is nearly of a dead level, its stream is necessarily sluggish.

There is much dry and arable land, but so little is this raised above the level of the river, that, were it depressed five or six feet, the ocean would reassert its sway over a large part of the eastern portion of the peninsula, leaving only narrow ridges along the sea-coast, and inland, here and there low islands. As it is, immense tracts are under water throughout the year, and the whole area drained by the St. Johns is a combination of dry land, swamps, lagoons, and creeks. Open prairies, pine barrens, palmetto hammocks, mixed forest growths, chaparals of saw-palmetto, thick jungles, and large tracts overgrown with tall reeds or rank grass vary the surface. From the absence of a change of level in the land, the distant views on the river are extremely monotonous, while the near ones are often of great beauty, because of the windings of the river, and the subtropical vegetation. The creeks and lagoons, with their rank vegetation, and also the wilder shores of the river, shelter vast numbers of water and shore birds, and also countless alligators, water moccasins, frogs, and other reptiles.

Of animals suitable for the food of man there is an abundance, as will be seen farther on, so that along the banks of the river and its tributaries, hunter-life could be easily sustained. The aborigines were, however, planters as well as hunters, for the first explorers found the land largely tilled, and the "Indian-old-fields" which can still be traced bear witness of the fact. Of all the American races none appear to have occupied a region more nearly equally divided between land and water, or one which had been more newly lifted above the level of the ocean, than natives of the shores of the St. Johns.*

*For a description of the physical features of the St. Johns River, the reader is referred to an article entitled *Cursory Remarks on East Florida*. By Major Henry

The shell-heaps we are now to describe were visited during the months of February and March, 1867, in company with Mr. G. A. Peabody, of Salem, Mass., and Mr. George H. Dunscombe, of Canada West, to both of whom the writer is largely indebted for aid in making explorations and for valuable contributions to his collections. The heaps are distributed over a distance of more than one hundred and fifty miles, between Palatka and Salt Lake, and are nearly all situated on knolls, seen here and there on the borders of the river, though a few are built in swamps or on dry land, at some distance from it. They are composed almost exclusively of one or more of the following species of shells, namely, *Ampullaria depressa* of Say, *Paludina multilineata* Say, and *Unio Buckleyi* Lea. Besides these, a species of Melania and a few Helices are found, but they, as well as a few marine shells, must be considered as accidentally present. The mounds vary much in size, from circular heaps fifteen to twenty feet in diameter, and a few inches high, to long ridges several hundred feet in length, and having a height from a few inches to four or five, and in some cases to fifteen feet. They are generally overgrown with oaks, maples, palmettos, bays, magnolias occasionally, and other forest trees, and not unfrequently with groves of the wild orange. The last, bearing a fruit both bitter and sour, has been supposed to be indigenous; but it would appear from the researches of Mr. G. R. Fairbanks, a gentleman thoroughly versed in the history of the peninsula, that they were introduced by the Spaniards.* We personally visited more than twenty-five of these heaps, but only a few of them

Whiting, U. S. A. American Journal of Science, Vol. XXXV, p. 47. To those who wish an introduction to, and a digest of, the literature pertaining to the whole State, the excellent work, *Notes on the Floridian Peninsula*, by Daniel G. Brinton, A. B., Philadelphia, 1859, is invaluable. This work also contains an account of the author's own investigations of the shell-heaps of the sea-coast.

* Mr. Fairbanks has observed that they are confined to the best camping-places on the river, and it does not appear that they are described or referred to in any of the Spanish records, which it is presumed they would have been, had the Spaniards found them there, since they so particularly mention other fruits. They are probably the Seville Orange run wild.

will be described, as they are nearly all essentially alike; an enumeration of the whole series will, however, be given at the end of the article.

The mounds of oyster-shells on the sea-coast of Florida have long since attracted attention; some of them have been described by Dr. Brinton, who has clearly set forth the grounds for the conclusion that they are of human origin.* The fresh-water shell-heaps have received but comparatively little notice, and have generally been supposed to be either fluviatile or lacustrine deposits, for which any one might certainly be excused for mistaking them at first glance. That they are the works of man the following observations are intended to show. Count Pourtales, however, visited the shell-heaps at Old Enterprise, Lake Monroe, in 1858, when he obtained from among the shells fragments of pottery, and of the bones of animals. He has not published an account of his observations, but informs me that he came to the conclusion that this mound was artificial.

The existence of shell-heaps in other regions consisting of the remains of fresh-water species, though from time to time noticed, have not been generally recognized. The first observation that we have seen with regard to them is by Atwater, who described mounds of mussel-shells on the banks of the Muskingum River, containing various articles of human workmanship.† Dr. Brinton, while connected with the Army of the Cumberland in the war of the rebellion, observed mounds of mussel-shells which had served to supply food to the Indians;‡ and during the last year the writer, in company with Mr. Ralph Waldo Emerson, Mr. Elliot Cabot, and others, examined a similar deposit on the banks of the Concord River, in Massachusetts, consisting of *Unio complanatus*, and containing charcoal, pieces of worked bone and flint.§ I am also informed by Professor J. D. Whitney, the

* Notes on the Floridian Peninsula, p. 166.
† Archæologia Americana, Vol. I, p. 226.
‡ Smithsonian Reports, 1866, p. 356.
§ Proceedings of the Boston Society of Natural History, Vol. XI, p. 243.

chief of the Geological Survey of California, and Dr. William H. Brewer, botanist to the same survey, that vast numbers of fresh-water shell-heaps exist there. Indeed there is an abundance of evidence for the belief that they are widely scattered throughout the United States.

I. SHELL-HEAPS.

King Philip's Town. This place was in a wild state until quite recently, and derives its name from a Seminole chief, who, it is said, once occupied it. The shell-heap, now converted into an orange grove, is on the left bank of the river, about a mile below the outlet of Lake Harney. Its situation is favorable both for hunting and fishing; the river is here sixty or seventy yards wide; opposite is the mouth of Deep Creek,* rising far to the eastward, and pouring into the St. Johns an excellent quality of water; to the rear and westward are open prairies and pine lands, and in the distance, to the north, is a large lake. The river contains an abundance of fish, but generally of a poor quality, except in the month of February, when vast numbers of shad pass on their way to Lake Harney, two hundred miles from the mouth, to spawn. While we were encamped here, the splashing of the water by shoals of these fish could be heard at all hours, from evening twilight to early dawn.

The shell-mound is about four hundred and fifty feet in length, and from a hundred to a hundred and twenty in breadth. It stretches at right angles to the river, borders a lagoon on the south, and on the north merges into cultivated fields, over which its materials have become somewhat scattered. Its greatest height is about eight feet. Fragments of pots may be picked up anywhere on the surface, and, with these, bones of various edible animals. As all such remains may have been deposited on the mound after its completion, excavations were made at many points from a few inches to

*There is another creek of the same name which enters the St. Johns on the right bank, between Pilatka and Picolata.

several feet in depth, to ascertain if similar objects were buried in its interior. The most unequivocal evidence that this mound, while in the process of formation, was occupied by the aborigines, was obtained from a pit between four and five feet in diameter, and from five to six feet deep, which was dug near the centre. Not only were fragments of pots and bones found at all depths, but at a depth of three feet the remains of an old fireplace were uncovered, consisting of a horizontal layer of charcoal, beneath which were perfectly calcined shells, and near these others more or less blackened with heat. Still farther off were fragments of the bones of deer, of birds, turtle and fish, all just as they would naturally have been left around a fire, where cooking had been for some time carried on. In addition to the above statement it may be mentioned as a matter of negative evidence, that not a single article was discovered which could have been attributed to the white man. Several excavations made in other portions of the mound yielded similar results.

Black Hammock. One of the largest shell-heaps on the St. Johns is to be seen here. It is situated on the borders of a large lagoon, on the left bank of the river just above the outlet of Lake Jessup,* and seven miles above Lake Monroe. Besides the principal deposit of shells, there are two smaller ones. At the westerly end is the first, a few inches thick, extending one hundred and fifty feet along the shore, and some thirty or forty feet inland. This is separated from the rest by a small watercourse, the outlet of a morass. The shore then takes a northerly direction for about two hundred feet, and consists entirely of sand; at the point where the shore again takes an east and west direction, is a second but smaller deposit, extending only a few feet to the eastward. One hundred and eighty feet from the point just mentioned is a small burial-mound, and a

*This lake was discovered by Lieutenant Peyton, of the U. S. Army, during the Florida war, and at first bore his name, which ought not to have been discontinued. It were better to preserve the Indian names if they can be learned, but if not, no one has a right to usurp a name which has been given by others in honor of the discoverer.

little more than a hundred feet from this begins the largest of the heaps, which measures about nine hundred feet in length on the river side, and has a breadth varying from one hundred to one hundred and fifty feet. It has been largely undermined, and sections, in some places from three to four feet in thickness, exposed. It is not improbable that originally this and the smaller deposits were continuous, the intervening portion having been washed away by the river. If this were so, the mound could not have been less than twelve hundred feet in length. It is intersected by a small stream near the centre, and is bordered by another at its easterly end, both outlets of small morasses in the rear of the mound.

That the Indians confined their encampments, or, at all events their cooking, almost entirely to these mounds, is proved by the fact, that fragments of pots were picked up in large numbers along the shore wherever the shells are seen in the bank, and, though careful search was made for them, not elsewhere. To make the evidence of the human origin of the whole deposit complete, pits were sunk at different points. One of these, about four feet in diameter, was dug entirely through the shells into the sand beneath, which was reached at the depth of four feet and three inches. Seventy-five fragments of pots and six pieces of the bones of the deer, thirteen of turtles, and two of the alligator were thrown out. These were scattered through the whole thickness of the shell deposit, but not a single specimen was found after the sand was reached. In a second pit of similar size, ninety-seven pieces of pots, six fragments of the bones of the deer, eleven of the turtle, and nine of the alligator were found. The shells found here are chiefly Paludinas, though Unios and Ampullarias are met with.

Old Enterprise is situated on the north-eastern shore of Lake Monroe, and forms a distinct bluff consisting entirely of shells. It has a front of about one hundred and sixty feet on the water side, and at the western end rises some-

what abruptly to the height of fifteen feet above the lake; on the top is a plateau, on which formerly stood a hotel and several out-buildings, and to the eastward the surface falls off by a gradual slope. On this side there is an extensive swamp, separated from the lake by a beach-wall of shells, consisting of the same species as those found in the bluff, and extending several hundred yards along the shore. As there are mingled with these shells the fragments of pots and bones of animals, they were all no doubt derived from the mound, and have been scattered by the action of the water. On the westerly side is a spring discharging highly sulphuretted water, and flowing into the lake through a small morass. The mound extends back from the shore about five hundred feet, but is of a very irregular shape, being much narrowed in its middle, and spreading out again in the rear portion into two unequal and irregular transverse ridges. While on the front the mound is composed of the three kinds of shells, the rest consists almost exclusively of Paludinas. That a large portion of this mound has been destroyed, and that the shore of the lake is receding, is obvious from its abrupt front, the distribution of its material along the shore, and the fact that twelve palmetto trees to the eastward of it are now surrounded by water, and their roots denuded to the depth of from two to three feet.

In consequence of the undermining of the front, and the looseness of the materials, which generally are neither compact or stratified, excavations were easily made. They were continued through several days, many cartloads of material were moved, and collections made from all depths below the surface, of whatever objects were mingled with the shells. These objects consisted of the articles already mentioned in connection with the other localities, and in addition various fragments of worked shells which will be described farther on. Although several arrow-heads and many flakes or "chips" of flint were picked up along the shore, none were actually found in the mound.

Excavations made in the ridges at the rear of this shell-heap did not yield precisely the same, nor so decisive results. The shells, consisting almost entirely of Paludinas, were much more compact, and the objects found in them much fewer. In certain directions there were appearances of somewhat extensive removals of material having been made, but whether by the Indian or the white man, we could not learn.

To the westward of Old Enterprise, which name applies to the bluff just described, is an orange grove, and beyond this an "old-field," which rests upon a thin deposit of shells, distributed somewhat uniformly over the surface. Excavations made here in many places gave the same results as were obtained at the bluff.

Horse Landing is a shell-mound on the right bank of the river a few miles above Pilatka, and eight miles below Lake George; it is three hundred feet in length, one hundred in breadth in the widest part, and rises abruptly in every direction. On the front it shows a vertical wall about eight feet high, giving a good section of its whole structure, the result of the action of the river which here makes a sudden bend. Underneath the shells is a layer of sand rising about four feet above the water, which at the time we visited the locality, was not much below its highest mark. In its general appearance the mound has the aspect of a geological deposit, in consequence of the compactness of the materials, the greater decomposition of these than is seen elsewhere, and above all, from its distinct stratification. The upper portion of the sand on which it rests is more or less mixed with fragments of shells, and still higher are alternate layers of these, and of shells mixed with sand; it is this condition which gives the whole its stratified appearance. At one place six such alternations were counted, but in others they were less numerous. None of the strata extended continuously through the whole length of the mound. Two explanations of this appearance are suggested: first, successive overflows of the river; second, interrupted occupation of the

mound. The first seems quite improbable. The water is not now known to rise above the lowest limit of the shells, nor in fact could it rise much beyond this, since the configuration of East Florida is such, that any unusual flow of water becomes at once spread out over the immense tracts rising only a few inches above the level of the river. Nothing short of subsidence of the land could bring the water to the level of the highest of these strata. The second is the more probable, but in the absence of proof can only stand as a reasonable conjecture.

In view of these facts the search for the evidence of man's work was important, and especially as the mound had the appearance of great age. The whole front, in which all the objects were undisturbed, was therefore most carefully examined, and with the following results: First, excepting within a few inches of the surface and in the vegetable mould, not a fragment of pottery was discovered; second, a few bones of the deer, more or less broken, were found, and one of them burned; those of the soft-shelled turtle, alligator, and garpike, as also numerous fragments of charcoal, were obtained at various depths between the top of the mound and the sand on which it rested. If to these we add an ornament made of bone, to be described farther on, we have the scanty evidence derived from the materials, for the conclusion that the mound was built by man. Mr. Peabody, however, made an important discovery which confirms this conclusion. He observed a piece of flint projecting from the sand just beneath and quite near to the lowest deposit of shells. It is to be remembered that in this part of Florida flint does not naturally occur, in fact that there is nothing but sand in which even pebbles are seldom seen. Before the flint was removed, we both carefully examined all the surroundings, and were satisfied that the flint and the sand in which it was imbedded had not been disturbed since the mound was begun. The front of the mound was vertical, the section was recent, and the small talus which forms below it is constantly removed.

Anything once detached is carried away by the current which is here somewhat brisk. When removed, the flint had all the evidence of having been "chipped," and was evidently the result of a rude attempt at an arrow-head. We cannot, therefore, in view of all the facts resist the conclusion that the mound was of human origin.

The only shell-heaps visited by us in which we failed to find satisfactory traces of man, was on the left bank of the river, a few miles below Hawkinsville (formerly Oceola). This deposit is one hundred and fifty to two hundred feet in length and eight feet high, has a swamp in the rear from which it rises very abruptly; on the front it has been so much undermined by the river that it presents a nearly vertical face, showing a good section through its whole length. A series of excavations had been made along the summit during the rebellion, for military purposes, so that there were unusually good opportunities for examination. Notwithstanding all this, we failed to find any pottery or other works of man at any point, except within a few inches of the surface. The contrast with Black Hammock and Old Enterprise was very striking. The mound was composed almost entirely of Paludinas, and, in some points, of these mixed with sand, forming a solid conglomeration. In this last we saw fragments of the tibia of a deer, which had been broken in the same manner as the bones from the other shell-heaps. The abruptness with which the mound rose from the level surface on the rear gave it the appearance, and this was the only circumstance which did, of artificial origin. — *To be concluded.*

THE BELTED KINGFISHER.

BY AUGUSTUS FOWLER.

This bird, *Ceryle Alcyon*, perforates the sand or gravel-bank for a breeding-place, preferring a situation near some

stream of water; sometimes, however, they select a place a mile or more distant from their fishing haunts. They will associate with the Sand-martins, and rear their brood in the same bank. Although there is a great difference in the disposition of these two species of birds in the management of their home affairs, as regards neatness and system of living, yet they live amicably together. The Martin, quiet and gentle in her manner, carries on the affairs of her household, which would do credit to many a housewife living in a higher sphere, and of whom domestic economists would do well to take a few lessons in the art of house-keeping. The tenement of the Kingfisher presents quite a different aspect. In it there is no nest of soft dried grass and downy feathers prepared for the nestlings, nor care of any kind for the reception of the eggs, except a cavity hollowed in the form of an oven at the extreme end of the hole, which measures in height from four to five inches, and in depth, below the passage leading to it, about three-fourths of an inch. The passages are usually from thirty to thirty-five inches in length; the first one is straight and about sixteen inches long; the second, which leads to the nest, diverges to the right or left, and is about the same length of the first one. On the bare earth, in the space above described, the female deposits from six to eight pure white eggs, which measure in length one and one-fourth inches, and in breadth one inch. Unlike the mild birds of the bank with whom it has the peaceful privilege of breeding with, it comes with a furious flight, with a fish still quivering in its powerful bill, with crest erect, and with a loud rattling voice, that wakes the echoes, and enters the hole, dividing amongst the brood the food it brings them. It requires but a short time to render the apartment a filthy one; the offal of their food, the excrements of the young birds, and the exhalations of their bodies, produce such a stench as to make it a wonder how they live and thrive in such an offensive place.

The Kingfisher is more cautious when it approaches its nest

before the eggs are hatched than afterwards. During the time the female is laying her eggs, she does not fly directly to her nest, but alights near by on the branch of some tree or prominent object, and raises her head and tail together, and at the same time her crest; she reconnoitres the place for some minutes, and, scanning every object closely, then, if not alarmed, she enters her hole. The entrance to her nest is not round, but in the form of an ellipsis. It is larger, but otherwise similar in shape to that of the Sand-martin. It is astonishing that so great an observer of natural objects as Mr. Audubon should represent the entrance to the nest of the Martin as being round; such a mistake, not being in conformity with the facts in relation to the posture and appearance of the birds he so beautifully delineates, destroys the harmony of his whole picture. The Kingfishers arrive early and prepare their nesting-place; they then lay their eggs, and incubation commences about the tenth of April.

NOTES ON TROPICAL FRUITS.

BY W. T. BRIGHAM.

[Continued from page 311.]

Ananassa (various species),—Pineapple, Ananas. The flavor of tropical fruits raised under glass is almost always inferior, but the pineapple is a marked exception. Perhaps no fruit differs more in quality in its own native land, some fields producing a rich juicy fruit, while the plantations near by yield only a dry insipid produce. Under glass, the golden and ruby cones are almost always good. The best specimens of pines come, it is said, from Guayaquil; but the little island of Niihau, in the Hawaiian group, produces a fruit rich and melting, such as is seldom found in the East Indies. Here they may be eaten as oranges.

The manner of growth is sufficiently familiar. A cluster of stiff, pointed, serrated leaves, two or three feet long, from whose midst rises a stem of about equal height, bearing on its club-shaped extremity a tuft of small leaves, beneath which, on the expanded part of the stem, are the violet, mint-shaped flowers. As the flowers fall off, each one is succeeded by a slight protuberance, and these all swell together, grow juicy, and at last the cone of the perfected fruit remains. The fruit varies in shape from an almost globular to a very acute conical form; a species of the latter form is much cultivated in Peru, and has white flesh, although many prefer a small fruit of dark red color externally, and yellow within. As the pine bears no seeds, it is propagated by cuttings; the crown of leaves, when planted, requires nearly three years to come to maturity, while the offshoots from the base bear in a twelvemonth.

The fruit is eaten raw or cooked, and the juice makes an excellent wine, or may be fermented as beer. A ripe fruit is best eaten by breaking apart the little radiating cones of which it is composed, and sucking each one from the centre outwards. The fibre of the leaves is most beautiful and silky, and is used largely in making the piña cloth. A field of wild pines, such as cover many of the islands in the Straits of Malacca, is almost as rough and inaccessible as a field of cacti, and the sharp stiff leaves are formidable weapons to the bare legs of invaders; but the bright fruit, peeping out here and there all through the wilderness of spines, is quite sufficient to attract gatherers. At night, as the land-breezes sweep down over these islands, they take with them the exquisite fragrance to comfort the poor sailors who may have spent the day in scratching their bodies and tearing their clothes in getting pines.

As an ornamental plant, the pine presides with queenly state in the beautiful Botanical Gardens at Singapore, and its huge golden yellow fruit, often fifteen inches long and seven to ten in diameter, might well look down in contempt

on the wretched specimens of its race thrown upon our wharves.

Tacca pinnatifida,—Arrowroot, pia. Of the many plants which produce the starch known as arrowroot, the tacca is the most important in the Pacific Ocean. On the Hawaiian Islands it grows wild, and its tuberous roots are much sought after. The plant is low, conspicuous only from its deeply cleft horizontal leaves, above which rises in the proper season a cluster of greenish flowers. The tubers are shaped like potatoes, and so far as known are never eaten raw, being quite acrid, although by no means so poisonous as the manihot.

Musa (various species),—Banana, Plantain. The best and most important of all tropical fruits, found in the tropics of every continent, and universally cherished by the people whose meat it is. Every one would know a banana at sight, and yet the pictures of the plant, even in our best text-books, are very faulty. One of the common geographies represent it as bearing two bunches of fruit; another, as having a distinct stem.

When the cutting or shoot is planted (and it requires a deep rich earth and much moisture to grow in perfection), it soon sends up two leaves, tightly rolled together, until the green roll has grown some two or three feet, when the blades unroll and become most tempting food for cattle of all sorts. These leaves are followed by others until the stems of the leaves have formed a smooth trunk some eight or ten inches thick, and sheathed by the drying or dried remains of the earlier leaves. At the end of nine months a deep purple bud appears in the centre of the leaves, and its constantly lengthening stem pushes it out beyond the leafy envelopes, and it hangs down heavily like a huge heart. Now along the stem are seen little protuberances in rows, extending perhaps two-thirds of the way around the stem, and as the great purple envelopes of the bud fall off, these are seen to be

little fruits, each with a waxen blossom and huge projecting stigma at the end. These are the female flowers farthest from the end of the stem, while as successive purple leaves fall off (you may see the scars they leave on any bunch of bananas), the male flowers are seen in closer rows and of the same waxen yellow color. The flowers are full of a good honey. Three or four months are required to ripen the fruit, and in the mean time the bunch of male flowers has withered and dropped away, and the ovaries of the female blossoms have swollen into bananas, it may be a foot long, and the huge bunch hangs down scarcely supported by the now withering stem. The fruit is ripe, and the banana has done its work, and, if left alone, soon dries up and dies. From its base spring up shoots which may be transplanted. If the stem is cut down to the ground as soon as the fruit is gathered, the round bulbous rootstock sends up new leaves, and a second plant matures much sooner than do the offshoots.

Although most banana bunches hang down in maturity, a kind is found on the Society Islands, whence it has been introduced to the Hawaiian, whose very large bunches of deep orange-colored fruit stand up erect, forming ornamental rather than useful objects; for their taste, even when cooked, is exceedingly disagreeable and acrid. The Brazilian banana, so-called (and no attempt is made to give here the correct names, as the nomenclature is hopelessly confused in different countries, and the bold writer who should attempt to write a monograph of this genus, would need all his courage), is tall, rising to a height of fifteen, or even twenty feet, and the fruit is yellow and excellent, rather vinous in flavor; these are the long yellow bananas common in our markets. The Chinese banana seldom exceeds five feet in height, the leaves are of a silvery hue, and the fruit quite aromatic. The Fei, or Tahitian banana, is similar to the Brazilian but not so tall, and the fruit is angular, yellow, turning black when fully ripe, and the flesh is salmon-col-

ored or buff, and slightly acid. Then there are varieties with red fruit quite common here, blunt fruit, and some with a very diminutive fruit of fine flavor. The names Banana and Plantain are used almost indiscriminately, but the latter usually applies to those varieties which are coarser and usually eaten cooked.

Usually no seeds are found within the pulp, but at Akyab, and along the coast of Arracan, a kind is found full of seeds. These seeds are black, rough, about the size of cotton-seeds, and enveloped in a sort of fibre so that they cannot be readily cleaned. The taste of this variety is very inferior.

The Spaniards have a curious superstition about the fruit. The cross section presents a rude cross, and from this they suppose the banana was the forbidden fruit, and Adam saw, in eating it, the mystery of redemption by the cross. The cross is not very distinct, and the excellent Padre Labat remarks, after mentioning this belief: "There is nothing impossible in this; Adam may have had better eyesight than we, or the cross was better shaped in the bananas which grew in his garden."

The ways of eating bananas are almost innumerable. Raw, they are eaten by themselves, or cut in slices with sugar and cream, or wine and orange juice. Cooked when green or ripe, they are fried alone or in batter, baked with the skin on, made into a pudding much resembling an apple dumpling, or baked in pies. They may be cut in strips and dried, or pounded into a paste and dried; in the latter form they are the staple food of many Mexican tribes. The amount of nourishment is very great, and Humboldt's statement is often quoted, that the same extent of land which produces one thousand pounds of potatoes, bears forty-four thousand pounds of bananas; a surface bearing wheat enough to feed one man, will, when planted with bananas, feed twenty-five. Lucky the people who can eat bananas, and leave the potatoes for the hogs!

The young shoots are cooked as greens, but the stem and

old leaves are full of a watery acrid juice, which stains white cloth an indelible black or dark brown. The fibres of the leaves make a textile fabric of great beauty, known as a fine kind of grass cloth.

In cultivation the plants are set closely, the Chinese banana requiring only three or four feet between the rows, and the clusters are gathered before they are quite ripe, and hung up in some cool place, or better still, buried in the earth. Some bananas are certainly improved by this premature gathering, but others are much better when ripened in the natural way. The prices on the Isthmus of Panama, and at most tropical ports, varies from a real (12½ cts.) to a dollar, according to the size of a bunch and the season of the year. The prices asked in the Boston market are simply outrageous, and our fruit-dealers let the fruit rot in their windows rather than lower the price.

A plantation will yield all the year round by timing the planting, but the crop is much more abundant at one season. The care the plants require is little enough if they are planted by a brook or in moist ground, and the bunches of fruit may weigh eighty, or even more than a hundred pounds when ripe.

The geographical limits of the banana are much more extensive than those of the cocoanut, and extend even beyond the tropics.

DIRECTIONS FOR COLLECTING LAND AND FRESH-WATER SHELLS.

BY JAMES LEWIS, M. D.

If the collector is provided with suitable apparatus for gathering certain classes of shells, his work is more than half done when he has *found* them. This is especially true of land shells. The apparatus needed for these is simply

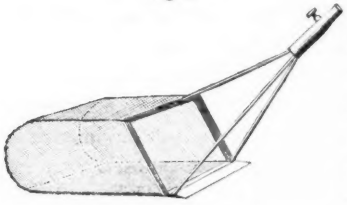
a tin canister, of sufficient size to hold all that may be secured at one time of species as large as *Helix monodon*, or larger. A large wide-mouthed bottle may answer the same purpose. The canister should have an easy fitting cover perforated for ventilation. The cork to the bottle may be perforated. For species less than *H. monodon* (one-third inch diameter), a bottle of alcohol that may be carried in the vest pocket will be desirable. The larger species are picked up by hand without any aids. The small species are often so fragile and so minute that a pair of delicate pliers, some like the light pliers used by watchmakers, but having wider blades, will be found so useful as to be indispensable. With the pliers the small shells can be rapidly picked up and conveyed to the alcohol. The use of the alcohol is to contract the soft parts to the smallest dimensions, by extracting the water they contain. It leaves the shells in a cleaner condition than when they are allowed to crawl over and cover each other with mucus and dirt. If it be desired to preserve specimens of those mollusks that are destitute of shells for anatomical purposes, they should have a separate bottle of alcohol to keep their mucus from enveloping the shells of small species.

To collect fresh-water shells the collector needs sometimes only his hands, especially in narrow rivulets where everything can be seen and reached from either side of the water. He needs a bucket of water for larger species,—a bottle of alcohol for minute species that would be likely to become lost or broken by association with the larger. Usually only a bucket of water is needed. For all those classes that crawl on or burrow in mud, some sort of *dredge* is needed. The simplest device that can be suggested is a tin dipper (Fig. 1), the handle of which may be made of any convenient length by adding thereto a light wooden rod. With a finely perforated instrument thus arranged, a film of mud with shells intermingled may be scraped up, the mud sifted

Fig. 1.

out, the shells remaining. The shells may be emptied into the bucket of water, and the dredging continued as long as desirable. For more rapid progress in collecting, a net made of iron wire-gauze, of about twelve to sixteen wires to the linear inch, is very useful (Fig. 2). The gauze may be stretched over a stiff metallic frame, so arranged as to form a bag, the mouth of which is about eight inches by four, with a depth of about eight inches. The net should be fixed at an angle of 45° with the handle. The outer margin (at the mouth of the bag) should have a sharp metallic edge like a hoe. A long handle is necessary; one that may be separated into parts, each about three or four feet long is most convenient, on account of the facility of adapting the length of the handle to the depth of the water, or to the position from which the collector has to work.

Fig. 2.



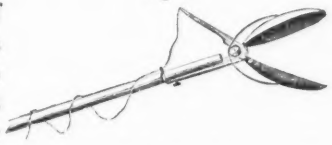
With a properly arranged apparatus of this kind, nearly all the small univalve and bivalve aquatic species may be secured with more readiness and in greater abundance than by other means. The shells that cannot be so readily obtained in this way are the fresh-water limpets (*Ancylus* and *Gundlachia*), which have to be taken by the slow process of removing them simply from the stems of plants or surfaces of stones to which they adhere, by sliding a knife-blade under them.

Many small species of fresh-water mussels (*Unionidæ*), such as are sometimes found abundantly in some of the Southern and Western rivers, are often readily attainable by means of the net. By proper manipulation the net may be made to scrape up a thin or thick slice of mud with the shells that mingle with it. Then reversing the net in the water, mouth upward, the sand and fine mud are sifted out, care

being taken not to fracture fragile shells, or break the brittle margins of univalves by too violent shaking. Shells that adhere to flat smooth rocks may be taken expeditiously with the net.

To take Uniones, the collector will succeed best in shallow water by wading. Long rubber boots are desirable for this work; also, a pair of metallic tongs (Fig. 3), the handle of one blade lengthened by a wooden rod, to be held by one hand to direct the instrument in its work, while the other hand pulls a cord that causes the other blade to close on the specimens to be taken. A basket carried on the arm serves to hold the specimens, which should be handled carefully.

Fig. 3.



An iron garden rake may sometimes be used with much advantage to uncover species where the current will wash away the turbid water. When the water is cleared, the shells may be seen and can be picked up by means of the tongs, net, or dipper, or even with the rake, if not too small. In lakes and ponds, where the bottom is muddy and the Uniones can be seen from a boat, the dipper, used so as not to make the water turbid, will answer the purpose. If the bottom is gravel the tongs may be used. In deep dark water in rivers, Uniones are sometimes drawn ashore in seines used for fishing. They have also been secured by means of rakes.

It often happens that there are small mollusks that feed on aquatic plants, and can seldom be found elsewhere. This is the case in lakes and in rivers that have only a moderate current. Such species will seldom be obtained with either net or dipper, and the collector will be obliged to content himself with slower processes. By carefully lifting the weeds out of the water the little mollusks may be found on the stems and leaves. They very usually detach themselves when disturbed, but if they are once fairly above the water,

very few are lost, for the reason that they continue to adhere to the wet weeds by capilarity. The pliers will be needed to pick them off and transfer them to the bottle of alcohol.

Preparation and Preservation of Specimens.—Land-shells and the larger aquatic univalves are generally cleaned, after boiling them a few minutes to detach the soft parts, by means of a little hook with which to remove the soft parts, a tooth-brush to wash the shell externally, and a syringe with which to rinse the interior of the shell. Sometimes the interior has also to be wiped out with a bit of cotton wound on a splinter of wood. The more perfectly a specimen is cleaned the more agreeable is its appearance. If portions of the soft parts remain in the shell the offensive odor of decomposition remains a long time. In the preparation of *Paludina* it is desirable to secure the opercle of each specimen in the shell to which it belongs, by means of thick mucilage. Some species of *Melanidæ* that have peculiarly formed opercles should receive similar attention. The larger species of *Sphærium* may have the soft parts removed, and the valves tied shut to dry. The smaller bivalves will dry if spread on paper in a moderately cool place with a free circulation of air, only a few of the shells gaping. If exposed to the sun they are very apt to open. Small shells like *Amnicola*, *Bythinella*, *Valvata*, etc., may be quickly dried in the sun after having been in alcohol twenty-four hours. The same remarks apply to some land-shells, such as the smaller *Helices*, *Pupa*, *Vertigo*, *Carychium*, etc. *Vitrina*, if carefully managed, may have the soft parts removed after boiling, or after having been in alcohol twenty-four hours. Cleaned and rinsed, the shells are exceedingly beautiful. But dried in the manner too often witnessed, they are not a very attractive addition to a collection of well-selected specimens. In the treatment of *Succinea*, either boiling, or twenty-four hours in alcohol, will answer, preparatory to the removal of soft parts.

Some mollusks, the shells of which are thin and transpa-

rent, when prepared for the cabinet simply by drying the soft parts, can never be made to have that brilliancy that is seen in a carefully cleaned specimen. By the side of well-cleaned specimens they are so inferior in their appearance, that when the collector has once had an opportunity to compare them, he will never be content with indifferently cleaned specimens. *Physa hypnorum* is a species to which these remarks will apply. It is, however, a very difficult species to clean perfectly on account of the persistence with which the soft parts adhere within the apical whorls. But by an adroit expedient this difficulty may be overcome. After the shells have been boiled a few moments, take each specimen up singly, and hold the apex a few seconds against the blaze of a lamp or candle. Soon a small quantity of steam forms with a slight explosion that loosens the soft parts perfectly. A jet of water from a syringe will then remove the soft parts and rinse the shell at one operation. *Physa hypnorum* may be kept in alcohol several months until partial decomposition has begun.. Then with a powerful jet of water from a very small syringe, the soft parts may be instantly and wholly removed. The same modes of treatment may also be applied to other species. Shells kept long in alcohol, however, are liable to become stained. *Lymnæa gracilis* permits the soft parts to be removed with the utmost ease and certainty by boiling or by the alcoholic treatment. *Ancylus* is very easily prepared after having been in alcohol. Indeed most of the specimens treated with alcohol will be found with the soft parts detached after a few days.

Uniones (fresh-water mussels) require to be cut open with a knife to divide the muscles, after which the soft parts should be carefully removed, leaving no traces of them to stain the shell. An easier and more expeditious mode is to boil them, when the muscular attachments are destroyed, and the soft parts are ready to drop out. After the soft parts are removed the shells need to be rinsed clean, and before the hinge-ligament gets dry the valves should be tied

shut, taking care to preserve perfect every part of the shell, not forgetting even the epidermal fringe. Specimens that have had the soft parts removed by cutting, are usually more brilliant than if boiled, or if the soft parts are simply macerated or dried.

Rare specimens of *Unionidæ* are sometimes found where the musk-rat has accumulated shells. It is sometimes an object with the collector to preserve shells found only under such circumstances. Such specimens when carefully washed will often be found to have a dull chalky appearance that is not indicative of the true character of the species. The brilliancy of the shell may be measurably restored by dipping it a few seconds in a bath of *dilute muriatic* or *nitric acid*, then rinsing with clear water and wiping dry.

Since naturalists have come to regard a collection according to the *perfection* of the specimens it includes, the habits that collectors were accustomed to indulge, in their attempt to beautify specimens, have pretty much gone out of use. It is no longer considered necessary to remove the epidermis of shells in order to develop unrevealed beauties, except perhaps in specimens intended to adorn a mere collection of curiosities. Even *varnish*, which once was so liberally applied to shells to impart a fictitious gloss, is now no longer used by those who aim to serve the purposes of science. Yet there are some circumstances under which a somewhat defective specimen may have its *natural* appearance partly restored, even when apparently of little value. After cleaning the shell carefully with a brush, moisten the whole surface with a dilute solution of gum arabic, wiping off the surplus. The gum when dry takes the place of the albuminoid tissues that have been dissolved out of the surfaces of the shell, measurably restoring its natural appearance.

Young collectors are often annoyed, after they have taken much pains to prepare fine specimens of *Anodonta* and some thin-shelled *Uniones*, to find that their specimens crack when dry, sometimes falling in pieces. This difficulty may be

avoided by dipping fresh specimens into a solution of *chloride of calcium*,—a hygrometric salt that always retains enough moisture to remain in solution under ordinary conditions of atmosphere and temperature. This salt may be prepared by neutralizing *hydrochloric* (or *muriatic*) *acid* with chalk.

The use of *varnishes*, *oils*, *glycerine*, etc., on shells is not recommended. A very thin solution of *gum arabic* has this advantage,—that if found objectionable it may be readily washed off without detriment to the most fragile specimen. From the general tenor of the preceding remarks on collecting, it will be understood that *perfect specimens* are above all others the most desirable. Such, usually, can be obtained only by securing them alive. When a species is abundant and the collector has obtained a large series of specimens, he will be able to select those which best represent its character. It is, perhaps, policy to return the younger and imperfect specimens to the station from which they were taken, as by so doing the species may continue with only slight diminution of numbers.

The collector is urged to avail himself of *opportunity* on all occasions to secure species, however abundant or undesirable they may seem to be at the moment. Many mollusks are noted for appearing in abundance for a brief period, then disappearing for a number of years. Sometimes artificial influences destroy a locality that produces abundant specimens of desirable species. The erection of a mill, or some chemical establishment on a stream, sometimes kills out many of the mollusks it would otherwise continue to produce. Tanneries, asheries, saw-mills, dye-houses, in fact all kinds of manufacturing establishments on streams interfere with the mollusks and other forms of life inhabiting them.

Incidentally, the collector of shells will unavoidably have his attention drawn to many other forms of life while seeking mollusks. Scarcely any of these will be so insignificant

that they may not deserve passing notice. While collecting land-shells, opportunities are often presented for securing specimens of valuable species of insects, crustaceans, and worms, especially rare and curious species of beetles and centipedes, whose habits necessarily lead them to seek shelter and concealment with the larger snails. The *chrysalides* of various species of *Lepidoptera* are also found in similar situations, and may be secured and preserved as a means of obtaining more perfect specimens of the mature insects than can be obtained by hunting the insects themselves. Various species of *Salamanders* (or "lizards," as they are often termed for want of a more appropriate name) may also be found in the damp grounds where snails seek shelter under logs, etc.

In searching for aquatic mollusks, many rare species of fish of small size, such as are just suited for the aquarium, will often be found and captured with the mollusks. Stagnant waters are rich in various forms of insect life, and some of the species are remarkably interesting for their singular forms and curious habits. In such situations will be found both the *larvæ* and perfect insect of several species of *Dytiscus* and allied genera, some of the species quite large, others quite small. Such stagnant waters also produce various other kinds of insects (see Vol. I, p. 328, fig. 2; p. 436, fig. 2), including those that *swim* and *skate* (Vol. I, p. 328, fig. 3) about over the surface of the water as well also as those that propel themselves boat-like *in* the water (Vol. I, p. 328, fig. 1). A limited class of *crustaceans* and *annelids* are found in similar stations,—all of them objects of curious interest, not less on account of the singularity of their forms than on account of the wonderful habits that disclose their adaptation to the conditions in which they are found.

To the microscopist, also, the stagnant water offers a world for investigation (Vol. I, plate 13, illustrates some of the forms). A little tuft of the green slimy vegetation that in such situations is found adhering to sticks, twigs, in

fact every surface covered by the water, is full of life in some of its most singular and wonderful forms, some vegetable, some animal (Vol. I, pp. 505 to 530 inclusive; also 587 to 595).

The stagnant pool is also the winter residence of numerous species of frogs and other *Batrachians*, for whose songs we listen in the warm showery evenings of the opening spring. Hither come also the wanderers in the fields and forests to deposit their eggs, which appear first endowed with life as minute *pollywogs* or *tadpoles*, ultimating in toads and frogs. The eft, or water-newt, a small brown *salamander*, marked with curious spots, is also found in the stagnant waters; and pools, on the borders of marshes, are the homes of various species of turtles. The larvæ of mosquitoes, of which our country has a great variety of species, abound in stagnant waters, and they will be readily found in every little puddle that has been a few days exposed to the sun's warming influence.

In the streams where there is greater purity of water, insect life is not so apparent. But here we have the curious cray-fish (*Astacus Bartonii* of the older writers) that in miniature apes the form of his marine cousin, the lobster. Here abound the larvæ of various species of dragon-fly (Vol. I, p. 279, fig. 5; Plate 9, fig. 1 to 7; p. 307, fig. 1; pp. 308, 309, 311) in somewhat greater abundance than in the crowded stagnant waters,—also the *larvæ* of various species of Caddis-flies (*Phryganea*), who form for their protection little tubes composed of fragments of wood, straws, etc., connected together by the silken secretion of the young insect. In rivers and lakes on the stems of aquatic plants, in June and July, will be found beneath the surface of the water numerous *pupæ* of a beautiful beetle, the mature insects glistening with burnished steel and bronze, flitting about and sunning themselves on the aquatic vegetation.

Life abounds around us everywhere. To call attention to a few forms that do not daily challenge familiar attention

has been the object of this paper. The subject is one full of interest,—one that has received the attention of the most vigorous intellects, and yet remains as full of undiscovered truths as in the beginning,—being, as are all the works of nature, a field of infinite variety, inexhaustible.

A COMICAL OWL.

BY CHARLES WRIGHT.

THE owl is called a solemn bird. It may be so; yet I have seen one in Cuba whose actions would upset the gravity of a very sober meeting.

The bird in question (*Glaucidium Siju* Orbigny) was taken young from the nest, and grew quite tame and familiar. His ordinary food consisted of lizards, though he would eat moths and other large insects. His power of swallowing was surprising. From the first, almost, he could dispose of the smaller lizards; but soon gained strength and throat capacity to take in specimens as long, if not quite so large, as himself; even two, three, or more at a meal. He usually commenced by tearing away, awhile, at the head, which, however, he did not seem to diminish much in size; after which came the effort, sometimes a protracted one, to swallow it entire—head foremost. With time, however, it took its regular supper (it had but one meal a day) with little apparent effort, unless an uncommonly large bit was given him. And so much did his appetite increase, that sometimes a scarcity prevailed; whether it occurred from the neglect of the negrito to cater faithfully, or from the paucity of the game. By day, he remained, solemnly, in the corridor, dosing away the lonely hours on a pigeon-cage, or on the beam supporting the eaves. Before learning to fly well, at night, after candle-lighting, he was taken down and placed

on the table to take his supper. Afterwards came the fun; and this consisted of actions, if not so dangerous, queerer than that ascribed to the one which continued to look at the man going round the tree till it twisted its neck off. He was curious to examine everything he saw in motion. If a moth scorched its wings and fell on the table, he would sidle round it till satisfied there was no danger to be feared, when he would seize it, if of a size to *be* seized, or make at least the *effort*, if too small, and, if hungry, devour it; or leave it to examine some new object. What, however, was particularly amusing was his observation of minute insects which were attracted to the light, and, of course, fell, unable to fly, but with power to struggle. And his vision was so acute, that he saw, instantly, across the table even, any new comer, though too minute to be readily seen by the spectators without a lens. Now he would approach the helpless sufferer, at first cautiously, as if taking roundings. Meanwhile he would stretch his neck upwards to its utmost extent and look directly down; then first to one side, now to the other, and twist his head round so that the eyes would be almost downwards and the beak upwards; all the time, sideling one way, then the other, till, at last, reassured, he would make a little leap, and pounce down upon—nothing.

"Sijuito" had other odd ways. His tail was not so large nor so brilliant as the peacock's. Perhaps he thought it was, which was just as well for him. At all events, he did his best to display what he had, as well as the more splendid bird. He spread it out to its utmost extent, cocked it up as high as it would go, and twisted it to the left and to the right, uttering, frequently, his monotonous *toot*.

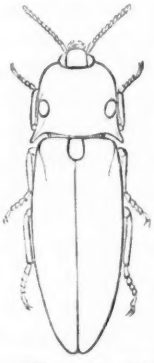
If one could have followed in "Gundlach's" tracks, and stopped at all his stopping-places, he would have found that bird in a greater number of attitudes, and all natural ones, than would be practicable with hardly any other, unless it were a parrot; inverted positions being reckoned among the number.

Our little owl became, at last, venturesome, wishing to see the great outside world; and, flying out of his safe domicil one night, he passed too near the cat, when the worthless beast killed the funny bird.

THE CUCUYO; OR, WEST INDIAN FIRE BEETLE.

BY G. A. PERKINS, M. D.

But few of the many thousands of organized beings that cover the earth are endowed with the power of becoming luminous, and it is because their number is so limited, and consequently that they fall so seldom under our observation, that our wonder is so great upon beholding them. About fifty of all the animals (if we except the Acalephs, or Jelly-fishes) are possessed of this power of shining. Thirty-four of these belong to the insects; and a large portion of these insects belong to one genus, the *Elaters*, or snapping-beetles, some of which we find about our gardens in summer, though our species are not luminous.



The only light-bearing insects found in our own locality are of other genera, *Photuris*, etc.; this is the little fire-fly which we find in damp fields or pastures on hot summer nights. It is the male of this insect only that flies; the female is wingless and but seldom seen; when found, however, her light proves to be very much brighter than that of her more active companions; this wingless female is the glowworm. The larva which closely resembles the female is also luminous, and even the eggs are said to be slightly so. We all remember these little sparkling fire-flies, and the queer thoughts that often pass through our brains on

first beholding them. How many times have we chased them, hat in hand, just at dusk in a warm summer's evening, and thought we were quite sure of our prize, when the next moment he was sparkling high in the air above our heads; and when, after many unsuccessful trials, we were so fortunate as to secure one of them, how have we feared to take the little harmless creatures in our fingers, lest we should be burnt; or how, when their light was temporarily extinguished, did we puff and blow, as if we had a live coal, to brighten them up again, so natural is the connection, even in the mind of childhood, of light with heat.

This feeling of wonder, and a desire to know somewhat more of so strange a phenomena, is not confined to children alone. Older and wiser heads have shared it too. The chemist, anatomist, and physiologist have each, by their peculiar method of investigation, endeavored to obtain an answer to the question, How do animals shine? Nor is it strange that after all their efforts, they should fail to obtain a clear solution of the difficulty. The chemist looks for phosphorus, a well-known constituent of the bodies of all, or nearly all, animals, but finds but little of that element in proportion to the amount of light evolved. Slow combustion is tried with a like unsatisfactory result. The physiologist looks for some sort of galvanic action, like that of the gymnotus or torpedo. The anatomist, with perhaps no preconceived notions on the subject, makes his careful dissections in hope that some arrangement of parts, undiscovered before, may reward his search and solve the problem; but still we fail to be satisfied. We must, therefore, believe that while the Great Lawgiver, in this as well as in other natural laws, employs means for the accomplishment of the end designed,—the production of light,—yet that these means bear no analogy to others intended to effect the same result, though under very different circumstances. The luminosity in animals is a power peculiar in itself, as truly and distinctly so as seeing, hearing, muscular contraction, or the exercise of any other power or

faculty with which animals are endowed by the Creator; and this phenomenon is produced by an act of volition of the animal, through the nervous power acting on a peculiar fatty matter, found only in certain portions of the body: or it may be that some of the brain masses, or ganglia, are specially appropriated to this particular end, and that there need be nothing peculiar in the fatty mass upon which its power is expended.

At the head of the list of light-giving creatures, and far exceeding them all in the amount and intensity of its phosphorescence, stands the West Indian Fire Beetle, called by the people of the islands, Cucuyo; by naturalists they are known as the *Elater* (Pyrophorus) *noctilucus*, or Night-lighting Elater. Though found in all the West Indian islands, the sugar plantations of Cuba are their paradise, and during the warm evenings of the rainy season they exhibit themselves to perfection. An amusing account of the method of capturing these beetles in olden times is found in the Naturalist's Library, which I copy for the amusement of the reader.

"Whoso wanteth Cucuij," says Pietro Martire, in his Decades of the New World, "goeth out of the house in the first twilight of the night, carrying a burning fire-brande in his hande, and ascendeth the next hillock, that the cucuij may see it, and hee swingeth the fire-brande about, calling cucuius aloud and beateth the ayre with often calling and crying out *cucuie*, *cucuie*. Many simple people suppose that the cucuij, delighted with the noise, come flying and flocking together to the bellowing sound of him that calleth them, for they come with a speedy and headlong course; but I rather thinke that the cucuij make haste to the brightness of the fire-brande, because swarms of gnattes fly into every light which the cucuij eat in the very ayre, as the martletts and swallowes doe. Some cucuius sometimes followeth the fire-brande, and lighteth on the grounde; then he is easily taken, as travellers may take a beetle if they have need thereof walking with his wings shut. In sport and merriment, or to

the intent to terrify such as are affrayed of every shadow, they say that many wanton wild fellowes sometimes rubbed their faces by night with the flesh of a cucuius, being killed, with purpose to meet their neighbors with a flaming countenance, as with us wanton young men, putting a gaping vizard over their face, endeavor to terrify children or women who are easily frighted."

By the kindness of a friend* I am now in possession of a thriving family of these strangely beautiful beetles, numbering over forty, of all sizes; and while I write, they are shining in all their brilliancy just by my side. Considerable care and attention is necessary to keep them in health. They are soon to have their supper, which consists of sugar-cane, cut into thin strips and moistened with weak syrup, which they suck, or rather lick, up with an evident relish. They present a singular appearance, ranged in rows upon the bottom of a plate, each with his mouth applied to the strip of cane. As soon as they have finished their meal, they are to take a bath for their health and comfort; for, like children who indulge in sweets, they get pretty thoroughly daubed, and need a good washing. This bath of tepid water seems to arouse all their light-giving energy, for while feeding the light is extinguished (very economical, surely!). The basin in which they float is all aglow; it is indeed a magnificent spectacle which I wish all your readers could share with me. The water seems to possess the same luminous property as the insects, and resembles, when seen at night, a basin of liquid gold.

As to size, form, and general appearance, the cut at the head of this article gives a good idea. It has been drawn by Mr. Emerton with his characteristic faithfulness from a full-grown insect. In color they are of a dark brown, almost black; the larger ones have a rusty appearance, from the presence of short brown hairs on parts of the back. They have nothing peculiarly attractive but their power of giving

*Mr. F. Margollis, of this city.

light. The spots, from which issue the luminosity, are not situated upon the head, as most persons suppose on seeing them, but upon the sides of the thorax, or middle portion of the body, and also from a spot on the abdomen just below the insertion of the last pair of legs, where the abdomen and thorax join. This abdominal spot is not so frequently seen to be illuminated as the spots on the thorax, but when the insect is about to fly, or when, by accident, it gets upon its back, this part gives out light of tenfold intensity. The side lights are oval and convex, standing out laterally, and are hard and horny externally; but this is only a very thin and transparent protection to the luminous matter that fills them. When not shining, they are of a dirty white or light-brown color.

They are really lanterns, and, as such, serve to light the insect on his nocturnal rambles. It is worthy of notice that these lanterns are so placed that the light from them never enters the eye of the beetle directly, but only when reflected from surrounding objects; in fact, they are placed just as we place lanterns upon our carriages, and for the same reason, that the light may not shine into the eyes of the driver to dazzle and confound him, but only upon objects before and around him, from contact with which he might be in danger. This light also serves to attract their friends, as I have had occasion to notice while a number of them were upon the wing together in a dark room. While flying, their light seemed to arouse their companions, who soon joined them, and we enjoyed the rare sight, at least in this region of the globe, of seeing several of these flying about my room at one time; they seemed to play as flies do during the hot days of summer. When preparing for flight, they appear quite restless, and climb upon the highest part of whatever they may happen to be upon, often the thumb, when held in the hand, their side lights glowing with great brilliancy, but surpassed by the spot beneath; the elytra, or hard horny cases that cover their gauze-like wings, now swing upon their hinges,

and, with a whirr, the insect starts off like a rocket. No power of description can convey a true idea of this singular sight, the tiny spark of our little fire-fly appearing like nothing in comparison; and this light is continued while they are in motion, and not intermitting like our own fire-fly. Their flight did not last many minutes (ages of torture to nervous ladies who might happen to be in the room!!), being often brought to an end by the insect flying against the mirror or window curtain, and falling to the floor; sometimes they would fly around one of the beetles which I held in my hand, and alight quite near it.

Beginning their gambols just as the daylight fades away, they keep in an active state for about two or three hours, when they become quiet, moving but little, and ceasing in a great measure to give forth light. I have often noticed this cessation of light just after a period of excitement, and also just before they were to make an attempt to fly,—the power of the nervous system seeming to exhaust itself by its vigorous exercise, requiring rest afterward, or else they rest to concentrate their energies for greater exertions.

Being "birds of night" they remain dormant during the day, hidden in the damp leaves or herbage, looking as if dead, but being full of life and activity as night draws on. I have endeavored to cheat them by taking them into a darkened room during the day, but the attempt was not successful, they still remained quiet until the usual hour; and when disturbed by rough treatment and placed near a window, they invariably crawled towards the darker parts of the room. One of my colony, by some mishap, got one of its side lanterns out of repair so that it emitted no light for two days, but after that time perfectly regained it. Most of the little pets seem to have met with the loss of one or more legs, and some have lost all; but this mutilation does not seem to interfere with their luminous powers at all. These poor cripples have to be assisted more than their companions when taking their food.

The light given off by this insect is of a very peculiar nature. When seen during the day it is of yellow color, strongly tinged with green; at night the green is not perceptible, and the amount of light given off, though considerable, is of an *intangible* character. I use the word intangible, for want of a better one, to describe the opalescent appearance of their lights when we look directly at them. Its effect upon the retina of the eye is, at times, painful when looked upon steadily for some minutes; and after being shut up in a dark room with them for an hour or even less, I have found, upon looking at the gas-light in the street, it had a brilliant red appearance, as intense as the crimson stars of rockets made by the burning of strontian. This effect lasted several minutes.

By placing the luminous parts of one insect quite near the paper, very fine print can be easily read by its aid, though I cannot imagine the light, even of a large number, to be sufficient for any *practical* illuminating purposes as has been affirmed by some writers. The Cuban ladies make a singular use of these living gems, sewing them in lace bags, which are disposed as ornaments upon their dresses, or arranged as a fillet for their hair.

The perfect control which the insect has over these luminous spots is very marked. While they remain dormant during the day, their light is wholly extinguished, not even a ray is then to be seen even in the darkest room; but as soon as they begin to crawl, that moment they light up their path with the lanterns on the thorax, not often using the patch upon the abdomen, except while flying or preparing for flight, and it is only while on the wing that their whole illuminating apparatus is displayed in all its intensity and beauty.

Their period of perfect insect life, even in their own native island, is quite brief, lasting only about three or four months, not one being seen before the commencement of the rainy season, which begins about April, and disappearing in July

or August. As this period draws to a close, they lose much of their vigor, their power of illumination grows less, even their bath fails to arouse them, and it wholly ceases just before death takes place.

The treatment which I have found to be most successful in keeping them in health, is that which imitates as nearly as possible their condition in their own climate. There they feed upon the sweet juices of the cane which they find accidentally bruised (for they have no organs for wounding the plant), being frequently drenched by the warm tropical showers, flying about briskly for a few hours only during the early evening, and hiding under the dark damp foliage during the day. And to give them, as nearly as possible, the same conditions, I bathe them with tepid water, feed them on weak syrup upon slices of cane, giving them their food in the evening, and, during the day keep them in an open-work basket, covered with fresh damp clover-leaves.

In my collection were insects of various sizes, but I was not able to perceive that the smaller ones gained any in size, though they ate well. Being perfect insects, it is doubtful if they require much nourishment, but only a sufficient amount of moisture to make good the loss by respiration and transpiration; the sugar, perhaps, giving it a relish, or, it may be, keeping up the fatty matter of the illuminating organs. I have never found the least trace of excrementitious matter about them. As the period of their life during which they feed most freely is confined to the larva stage, like other insects, it is only during this time that they increase in size. I find no mention in any work of the nature of the food of the larvæ of this particular species of Elater; but some of their cousins are said to be very destructive to the roots of plants, particularly of the grasses.

An examination of the peculiar matter upon which their power of luminosity depends, or in which it manifests itself, shows it to be composed, in a very large portion, of fat, in which are found some air-tubes and a very large supply of

nerves. This fatty matter is of a chalky whiteness, and, when spread upon a slip of glass and examined by the microscope, gives the characteristic appearance of fat globules. When rubbed upon paper and warmed, it leaves a greasy stain; and when the whole mass is digested in sulphuric ether, the fat is dissolved out, leaving branch-like masses of nerves in great abundance, and also the tubes of the air-vessels. The mass of luminous matter upon the abdomen is, as has been stated, many times greater than that upon the thorax, and is covered externally by a very delicate and flexible membrane, which forms the joint, and reaches completely across the animal. Inside it has not so distinct a boundary, the vessels of other portions of the body being continuous with it, the luminous matter still being quite distinct. In the thorax, this same substance is found lying behind the two oval, convex, transparent membranes, of a horny nature, being separated from it by a very thin transparent membrane, which acts as a special envelope, and is also supplied with nerves and air-tubes, as in the abdominal portion.

It becomes very evident to any one who attentively examines these insects while in a living and healthy state, that their luminous power depends, not upon chemical action, as does the air in our lungs during respiration, which action must go on entirely independent of any voluntary effort on the part of the possessor, but that it is completely under the control of the animal, and is used by it for purposes which render its exercise at times wholly needless. It is also evident that whatever arouses the nervous energy of the animal to full activity, causes a corresponding manifestation of luminosity; and, on the contrary, whenever the insect is placed in media which depress its vital powers, and act either directly or indirectly upon its nervous masses, then it ceases, wholly or in part, to give out its light, using it as means to accomplish a desired end, as truly as its muscular power.

In concluding this paper, already unnecessarily long, I

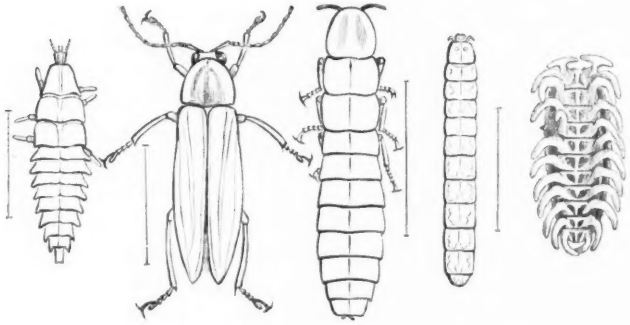
cannot omit to give the reader an extract from a letter from Cuba which I have just met with, by a most pleasing writer,* which gives a vivid description of this insect as seen in its native island. The writer, after a most amusing account of several insects with which she (?) came in contact, says:

"But a really beautiful and interesting insect is the Cocuyo, or famous fire-fly of the West Indies, two of which I now have on my table in an impromptu cage, where they have been domesticated for a week. Very docile are they in my hands, to whose touch they seem to have become pleasantly accustomed, taking kindly to a diet of moist sugar in lieu of sugar-cane, which is their appropriate aliment, and accepting a semi-daily bath in my wash-basin with great apparent enjoyment, floating about in the water for several minutes, and then spreading their legs and feelers as a sign that they are ready to come out. They are a sufficiently unattractive bug in their unilluminated state, being of a dingy earth-brown color, and about the shape and size of a large cockroach; but they become so glorified by the irradiation of those wondrous orbs of phosphorescent light which they carry about on their shoulders, that the children scream with delight at the sight of them, and ladies make pets of them as I do, and even use them as ornaments on some occasions. I saw a lady at the 'Retreta' once, with a coronet and stomacher of them; and all the crown jewels of Spain could not have made her so resplendent. The light is not a flash, seen for a moment and then gone, like our fire-fly, but it is emitted in a brilliant, steady ray, at will, and is of extreme beauty of tint, being of a slightly greenish yellow viewed in some positions, and of pale red viewed in others. It is a touching fact, that the poorer classes, when severe sickness visits their dwellings, confine a half-dozen of the Cucuyos in a cage, and are thus furnished with a most beautiful and inexpensive light for night-watchings."

*W. M. L. Jay, in "The Churchman" of June 13, 1868.

It is to be hoped that, with the modern facilities for short passages from Cuba, we shall every year be able to see, even in our frigid climate, a large number of these distinguished strangers.

Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.



NOTE.—We figure several examples of our native fire-flies, with a figure (Fig. 3) of an adult female glowworm from Zanzibar, which closely resembles the English glowworm (Lampyris). Fig. 1 is, very probably, the larva of a genus allied to *Photuris*, of which *P. Pensylvanica* (Fig. 2) is the adult male, enlarged twice, as are the other figures (the lines by the side of the figure shows the length of the insect itself). We found this larva early in May, under a stone in damp ground, at Swampscot, Mass. It is represented as in the act of walking, the feet on one side of the body moving alternately with those on the other. This is the way insects generally walk. It was not luminous on the evening of the day it was discovered. But a truly luminous larva (Fig. 4) has been communicated to us by Mr. Sanborn; it was found at Roxbury, Mass. We have been as yet unable to refer it to its proper genus and species. Fig. 5 pictures a most singular larva, belonging evidently to this family, and related to the genus *Drilus*. It was found by Rev. E. C. Bolles, at Westbrook, Maine, under leaves, and it, probably, like other larvæ of fire-flies, feeds on land snails, etc. The body of this remarkable insect is very flat, so that it looks as if there could be no room for the viscera. On opening the box, it remained stationary for so long a time, that we thought we had before us the dead and dried remains of an insect, which puzzled us exceedingly as it was, but more, when it slowly moved before our astonished vision. To talk of an insect winking its eye is a heresy, but we imagine there must have been an involuntary twinkle in its mind's eye at our innocent surprise at its movements. Here, indeed, was one of those forms so often observed

by naturalists, which mimic other objects for purposes of self-protection. Our comical larva has, doubtless, had many a laugh over the balked research of its carnivorous foes, for it so strongly resembles a dead and withered leaf with its edges variously incised and turned up, as to escape any but the sharp eyes of our conchological friend. As seen in the figure, the sides of the head and each ring of the body is produced into a remarkably long, soft, fleshy tubercle, and there are two rows of black spots along the back. The figure is drawn over twice the natural size.

In the "American Entomologist" (noticed in our Reviews) are drawings showing the transformations of another genus of fire-fly, the *Photinus pyralis*. The larva feeds on soft-bodied insects, probably the earth-worm, and, when full-grown, forms an oval cavity in the earth, where it transforms into a pupa, and in ten days assumes the beetle state. — EDS.

REVIEWS.

THE PERCHERON HORSE.*— We cannot notice this work better than by quoting the following short preface of the translator:

"The little volume which is now presented to the notice of the lovers of the horse in America is a translation of the work of a distinguished French author, who, holding a high position of trust, made this as a report to the Government. His views in some respects may be regarded as extreme, but on the whole they are characterized by strong common sense, and are supported by a practical familiarity with all the phases of his subject which should give them weight.

The Percheron horse, no doubt, stands first among the draft-breeds of the world. His value has been thoroughly tested in this country, and the fact is established beyond a cavil, that with careful breeding, and probably an occasional renewal by the importation of fresh blood, the Percheron maintains his superior characteristics, and impresses them upon his descendants of only one-quarter or one-eighth blood to a very marked degree. The value of fast trotters, their encouragement by Agricultural Societies, and the enormous prices which have been paid for animals valuable simply for their speed as trotters, has, no doubt, had a tendency to direct the aims of horse-breeders in a wrong direction. The result is, from whatever cause it comes, that the true horse-of-all-work has been neglected. The Percheron, combining as he does a certain attractiveness of style, very free action, considerable speed united to power, with astonishing strength for his weight, and the greatest kindness and docility, seems to offer to American horse-breeders an exceedingly useful animal, either to be maintained distinct, or used for improving our stock of both light and heavy draft-horses by crossings. The value of this work, however, does not consist in its recommendation of this breed, or demonstration of its value in France, but its bold discussions of the principles of breeding as applied to the improvement of the Percherons, and equally applicable to that of other draft breeds, will, doubtless, commend themselves to the careful consideration of breeders.

Interest in the Percherons has increased greatly of late. Several notable importations have been made, and excellent representatives of this noble breed are to be found in the Eastern, Western, and Middle States. The engravings which embelish this volume are portraits of animals owned by Mr. W. T. Walters of Baltimore, Md., through whose interest in this subject the Publishers were induced to issue this translation of M. Huys' work."

The following remarks by M. Du Huys, on the Arab as the *Primitive*

*The Percheron Horse. Translated from the French of Du Huys. Illustrated. 12mo, 1868. Orange Judd & Co., New York.

Horse, and his relation to the Percheron, will not be uninteresting to our readers:

"I commence with the Arab crossing. Two motives have induced me to follow this classification:

1st. The Arabian is the type-horse, and the type should be examined before its derivatives.

2nd. The Percheron shows a very great analogy, by his coat, conformation, character of race, mild disposition and endurance, to the Arab, of which he seems to be the son, notwithstanding certain differences, the result of time, climate, and the region in which he is bred and in which he lives.

I have said that the Percheron horse exhibits in common with the Arab numerous marks of a common parentage and relationship: these marks are very obvious. A Percheron, a true Percheron, for some still exist (as the famous *Toulouse* of M. Cheradame, of Ecouche; and the renowned *Jean-le-Blanc* of M. Miard, of Villers, near Sap, in the department of the Orne, etc., etc.), placed alongside of an Arab, presents, notwithstanding his heavier and grosser form, analogies with him so striking that we are easily induced to believe them undoubted relations.

The Percheron of the primitive type has a gray coat like the Arab; and like him an abundant and silky mane, a fine skin, and a large, prominent, and expressive eye; a broad forehead, dilated nostrils, and a full and deep chest, although, the girt with him, as with the Arab, is always lacking in fulness; more bony and leaner limbs, and less covered with hair than those of other draft-horse families.

He has not, it is true, the fine haunch and fine form of the shoulder, nor that swan-like neck which distinguishes the Arab; but it must not be forgotten that for ages he has been employed for draft purposes, and these habits have imparted to his bony frame an anatomical structure, a combination of levers adapted to the work he is called upon to perform. He has not, I again acknowledge, such a fine skin as the Arab, nor his prettily rounded, oval, and small foot; but we must remember the fact that he lives under a cold climate, upon elevated plains, where nature gives him for a covering a thicker skin and a warmer coat, and that he has been for ages stepping upon a moist, clayey soil.

In all that remains in him, we recognize a heavy Arab, modified and remodelled by climate and peculiar circumstances. He has remained mild and laborious, like his sire; he is brought up like him, in the midst of the family, and, like him, he possesses in a very high degree the faculty of easy acclimation. He acquires this in the midst of the numerous migrations he accomplishes in Perche, the counterpart of those that the type-horse makes upon the sands of the desert. A final comparison, which has not, as yet, been sufficiently noticed, is, that, like the Arab, he has no need of being mutilated in order to be trained, managed and kept without danger. In a word, the Percheron, notwithstanding the ages which separate them, presents an affinity as close as possible with the primitive horse, which is the Arab.

From this similarity of form and probable relationship, comes the thought of new alliances. But in order to form a more easy estimate of their effects, it will not be without interest to classify the horses with reference to their origin. This classification produces three very distinct groups: the primitive horse, the natural horse, and the compound horse.

The *Primitive Horse*, oriental in its origin, is the pure Arabian horse; no other is acknowledged.

During the time of the crusaders, as we have already said in our first part, in consequence of wars and all kinds of excursions, individuals of this race were spread over almost all parts of the globe. Although at first the prestige which their superior merits deserved led to their being bred in-and-in, these exiles were placed under different latitudes, in different atmospheric and hygienic conditions, which gradually modified their qualities and led to the degeneracy of the race. And it became more or less degenerate in proportion as the soil upon which the colts were foaled was colder, poorer, and more inhospitable; *for the horse is as much, and more, the son of the soil upon which he is foaled and reared as he is of his sire and dam.*

This fact has no need of proof. We see it every day before our eyes in studying at home the changes that our French breeds themselves undergo when transported from one province to another. It might, however, be thought that these new latitudes, these new regions, would differ but little from those in which they lived.

The first change that the primitive horse undergoes, from the difference of the regions into which he has been transplanted, being due to nature itself, we call the result the *Natural Horse*. Here it is proper to remark how wise nature always is. If it modify the primitive horse for the worse, it modifies him, however, under conditions better adapted to his wants. In rendering him more puny, it renders him more temperate, and enables him to live and to nourish himself upon the food that the locality is able to furnish. Submitted to the trials and the

fatigues of war, and to all the miseries in its train, the natural horse, badly built, ungainly and puny as he is, endures fatigue almost as well as the primitive horse.

The *Cross-bred Horse* is, as his name indicates, the issue of a sire and dam of different breeds. This crossing, made with a view to improvement, may give, when judicious, more elegant, better made, and finer bodied progeny and also quicker in their various gaits, but always requiring, especially if derived from the English, exceptional care, and so much the more particular as they are of a more *distingue* nature.

Abandoned to himself, deprived of blankets, shelter, grooming, and oats, the cross-bred deteriorates early, and in war perishes miserably, while the natural and the primitive horse thrives in browsing upon the scantiest herbage. On this score, our two campaigns of the Crimea and Italy have furnished unquestionable proofs."

American Deer.*— In this paper Mr. Caton gives us much interesting and valuable information on the habits, anatomy, and physiology of the Elk (*Cervus Canadensis*), and the Deer (*Cervus Virginianus*). As the author's account is the result of personal observations and experiments, made with great care on a herd of about sixty deer and twenty-one elk, kept in his extensive parks for the last six or eight years, his little pamphlet will be invaluable to any one following in this study. Several new points in the physiology of the deer and elk are brought out, and many popular errors corrected. The supposition that a buck attains a new prong to his horns every year, is shown not to be the fact, as young bucks often have more "points" than old ones. He also gives much valuable information on the shedding and growth of the horns in both species, and a careful account of the different stages in the growth of the coats of hair and fur. He describes the deer as shedding its coat twice a year, and appearing in a red and a blue coat, while the elk sheds its hair but once. We would like to make many extracts from Mr. Caton's paper, but space will not allow, and we must refer the reader to the pamphlet itself.

Catalogue of the Pilenogamous Plants of the United States, East of the Mississippi, and of the Vascular Cryptogamous Plants of North America, North of Mexico. Compiled, arranged, and published by *Mr. H. Mann*, of Cambridge. The species are all numbered, and we find that there are 3,646 Flowering Plants known in our territory, east of the Mississippi, while but 178 of the higher Cryptogams occur in all North America, a smaller proportion we are inclined to think than will be found on any other continent.

We believe the catalogue was published with special reference to the convenience of botanists who might wish to make exchanges, and for this purpose it will be an invaluable aid, but every one interested in our flora should have a copy of it at hand, as at once the most convenient and most comprehensive thing of the kind ever issued in the country.

The Publisher will send it to any address in the United States, upon the receipt of the price (25 cts).

The Canadian Entomologist. — We have received the first number of this new enterprise, issued at Toronto, August 1, 1868, in 8vo size, at 50 cents a volume. It is to contain original papers on Canadian Entomol-

* American Cervus. By Hon. John D. Caton. Pamph., 8vo, 1868. From the Transactions of the Ottawa (Ill.) Academy of Natural Sciences.

ogy; the transactions of the Entomological Society of Canada; accounts of the capture of new or rare species in Canada, lists of specimens for exchange, and desiderata, by members; and correspondence, etc.

The present number, consisting of eight pages, contains an account of a luminous larva, by Rev. C. J. S. Bethune, and the first of a series of valuable papers on the transformations of butterflies and moths by W. Saunders: the present number giving a detailed history of *Polyommatus Americanus*, our common coppery butterfly; of *Arctia Parthenos*, and *Drasteria erecthea*. The Canadian Entomologist deserves a wide circulation and generous support from entomologists.

THE AMERICAN ENTOMOLOGIST.*—We gladly hail the appearance of this new monthly, which merits a wide circulation among farmers, gardeners, and horticulturists, as well as entomologists, to whom it promises each month to bring new facts regarding the habits of our insects. We have no doubt of its entire success. The study of insects is a practical subject of the highest importance to a people whose main dependence is on the soil.

The Editors, in their salutatory, insist on the importance for agriculturists, of a good practical knowledge of insects. They state, and we believe with reason, that "the United States suffer from the depredations of noxious insects to the annual amount of *three hundred millions of dollars*." By a diligent study of the habits and forms of these insects, their ravages may be greatly stayed, and, as the Editors compute, a million and a half dollars be annually saved to the country. Indeed each state in the Union should have a salaried entomologist. Massachusetts led off in publishing the three editions of Harris's Treatise on Injurious Insects, though the author received compensation barely covering the cost of the paper which he used and the time spent in reading the proofs, but the State never created the office of State Entomologist, though more money has been, perhaps, appropriated for entomological purposes by this State (the third edition of Harris' work costing some $10,000) than any other in the Union. For twenty years the State of New York has had a State Entomologist (Dr. Asa Fitch), whose reports, like that of Dr. Harris, have been a credit to the author, an honor to the State, and a valuable contribution to American science.† New Jersey has had for several years a State Entomologist, Dr. J. P. Trimble, whose work on the Insects Injurious to the Apple-tree was not, we believe, published at the State expense. Within two years the State of

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*The American Entomologist, Vol. I, No. 1. Published monthly by R. P. Studley & Co., 104 Olive street, St. Louis, Mo. One dollar per annum in advance. Editors: B. D. Walsh and C. V. Riley. 8vo, double columns, pp. 29, with original illustrations on wood (nine excellent ones in the present number), and one colored lithographic plate in each volume.

†Mr. Walsh states, that "at a recent public meeting of the New York Agricultural Society, Senator A. B. Dickinson gave it as his deliberate opinion, that the writings of Dr. Fitch had saved annually to the single State of New York, the large sum of fifty thousand dollars; and, so far as appears from the record, not a single dissenting voice was raised against this most remarkable assertion."

Illinois appointed Mr. Walsh Acting State Entomologist, and that gentleman has published his first report on the Injurious Insects of Illinois, containing facts of great value to the farmers and gardeners of the West. Mr. Riley has been appointed State Entomologist of Missouri, and it is not yet time for his report to appear. Entomologists residing in other states, have at various times, published entomological articles in the yearly State Agricultural Reports. But the public are beginning to realize that the results of the labors of scientific men, freely given for the good of the country, deserve, and should receive, some remuneration. A pittance given from the public treasury to aid in the researches of the naturalist, the chemist, or the physicist, we venture to say, will prove, sooner or later, a safe investment.

Our readers will find the present number of the "American Entomologist" a very readable one, and we advise them to send for it. Mr. Walsh believes that the Seventeen-year Locust never stings, in which opinion we concur, but he farther suggests that the severe sting said to be made by this, to man, harmless insect, is made by the great *Stizus*, a burrowing wasp, which stings and paralyses the locust with which it provisions its nest, and might sting any person "that stands in their way." He also relates the interesting habits of *Anthophora sponsa*, a solitary Mason-bee; the habits of any species of this genus not having before been observed in this country. The Plum Curculio is said by Mr. Hull to attack the peach-tree, making the well-known crescent-cut in the bark, in which their eggs are deposited in June. They also sting the peaches, but the larvæ growing from the eggs die, the peach withering when falling on naked ploughed land. Mr. Walsh verifies these statements, and gives us an account of the Hull "Curculio-catcher." An account, well illustrated, of a new Bark-louse on the Osage orange, with notes on the Cotton-worm of the South, Grasshoppers, Fire-flies, etc., etc., and Answers to Correspondents closes this promising number.

NATURAL HISTORY MISCELLANY.

BOTANY.

Cross Fertilization. — A plant has just blossomed in the Cambridge Botanical Garden, which shows so plainly a design to effect cross-fertilization, that a brief account of it cannot fail to be interesting.

It is a *Posoqueria* — one of the immense natural order of Rubiaceæ; a native probably of Central or South America: the particular locality whence our plant came being unknown. This individual is a shrub about two feet high, and the flowers, in a cluster at the tips of the branches, are white (or the tube towards the base greenish) and about five inches

long, terminated by a five-parted border less than two inches across. The tube is slender, and around its mouth is a finely-cut fringe of the same color and texture as the border itself, and on its inside are scattering hair-like glands. The flowers are horizontal or slightly drooping, and are very sweet-scented; nor do they thus attract insects without having already prepared a store of honey to reward them for their visits. But the entrance to the tube *seems* guarded. Before the flower opened, the upper part, or limb, or border, was about egg-shaped and bent somewhat downwards. After expansion, the anthers are seen cohering in a mass, nearly opposite the mouth of the tube. The five filaments which support the anthers are of unequal length; the upper lateral — as I propose to call them — being sensibly longer than the lowermost and the lower-lateral pair. Hence, so long as the anthers cohere, the longer filaments must be curved. If they had bent directly forwards, they would nearly or quite cover the orifice of the tube; but they curve laterally and downwards, thus leaving it open. The filaments are very elastic, or, better perhaps, have a strongly contractile tissue on their inner surface, or an expansive one on the outer. The flower is very sweet-scented, and has honey at the bottom. But it is so far away that no insect but such as has a very long sucker can reach it. A large crepuscular moth can do it, perhaps. These moths fly swiftly — with force enough to touch off the spring gun set for them. A light pressure on the tip of the anther-mass causes it to fly apart, scattering the pollen all about, and to a considerable distance. The explosion is caused by the elasticity of the filaments above described, and the object is plainly to deposit the pollen on the breast of the insect, that it may be conveyed to other flowers. In the explosion the lower filament has sprung upwards and now lies close over the mouth of the tube, while the other four are bent sideways, the anthers of each pair still cohering. The insect, even if not scared at such trifles as the shot which greets him, can now no longer continue his feast, but goes away, with his breast bepowdered, to another flower, on whose stigma some of the powder is deposited.

But now we are met by a difficulty. We do not know if there exists a flower whose stigma projects outside of it. We *do* know that the stigma of the flower which shot him is nearly half-way to the bottom of it, inside the tube. Perhaps some of the pollen is on his sucker and may thus be borne to the stigma.

It is well known that this family of plants has many species which are dimorphous, as we call them; some flowers having long stamens and short or imperfect styles, others having long styles and short or imperfect stamens. These last generally produce all the good seeds; or at least more or better seeds than the former. Such is probably the case here; but, as I said, we do not know that it is so. In the native country of our plant there may be others with long styles. If, however, the style is always so short, we may still believe that a portion of the pollen (and it seems to need but little) is conveyed by the sucker of the moth to some

other flower, and thus the seeds become perfected. But if the lower stamen remained in the position it assumed at the time of the explosion, no insect could thrust its proboscis down the tube. So, after a time, the stamen rises and bends gradually back to its original position, leaving free access to insects ever afterwards.

We have an account of a plant whose flower looks, in every particular, like ours, and whose action is the same, except that the separation of the anthers was not produced by pressure on their tips, but by the irritation of the filaments near them.

In the twenty-fourth volume of the Botanische Zeitung, for the year 1866, on pages 129 and following, is a narration, by Fritz Müller, of numerous and varied experiments made by him on a plant, which he calls *Martha fragrans*, found on the island Santa Catarina, near the Brazilian coast, at a place called Desterro. He gives a figure of the flower, and if he had made it from one of ours, he could not have made it more like them; only that he makes no mention of the hairs on the inside, and he says the stigma is twisted, which was not the case in our plant. According to his observations, the lower and lower-lateral filaments could be rudely handled without effect; yet the lightest touch on the inner curvature of the upper filaments near the anthers produced an immediate explosion. Unfortunately all our flowers but one had fallen before my attention was drawn to Mr. Müller's account; and, even then, by a misunderstanding in reading German, in which I am not proficient, I mistook the precise spot where, according to him, the sensitiveness resides. I tickled faithfully, however, the filaments towards their base, without any satisfactory result.

Mr. Müller gives his views briefly thus: A moth, on thrusting its proboscis into the tube of the flower, will very surely touch one of the filaments and produce a discharge of the pollen. It will then go to another flower and convey some of the pollen to its stigma. And he, as it seems, did not *know* whether or not there are flowers with a projecting stigma.

His account and explanation are not quite satisfactory. It seems difficult to believe that in his plants the very simple mechanical mode of explosion could have existed and have escaped his observation. It seems equally difficult to believe that the two plants are not identical. There are, besides, objections to his view. There is nothing to prevent an ant, or a fly, or any other small insect, from causing a useless discharge of the pollen, according to his view and experiments, whereas it is quite plain that such small insects could never convey the pollen to the stigma, if, as in our plant, and apparently in those experimented on by him, it is deep within the tube. There is also another objection to his view. The curvature of the upper filaments form a circle of much larger diameter than the mouth of the tube, so that, it appears to me, it would be the merest accident that the sucker of the moth should touch a filament unless he swayed very much to one side. According to the experiments made here, the moth—a swift-flying heavy insect—comes to the flower

with momentum more than sufficient to cause the discharge of the pollen upon himself. In the other view, the influence, whatever it may be, must be conveyed along the filament to the anther; and, *how* it produces its effect there is equally mysterious. Mr. Müller did not ascertain by what means the anthers are made to cohere. However it may be, a simple mechanical force in the case of our plant sufficed to break up the cohesion; and I can hardly doubt that the true solution is the same in the case of Mr. Müller's plants, and that it was by the merest accident that he did not discover it.

These remarks, it is hoped, will serve to direct attention to the plant in future. It is quite likely it may exist in other gardens in this country, and, if not, there can hardly fail to be specimens of it in European conservatories.—Charles Wright.

The Onion Plant, so called, is a singular bulb cultivated for the graceful habit of its long sheathing leaves tapering to a narrow point. It is the *Ornithogalum alliaceum* of the gardens, and employed to decorate pedestals in artistical collections of plants; the bulb is of a lively green color and grows upon the surface of the earth, sustained in an erect position by its fibrous roots only. A specimen has lately blossomed in this city, throwing up a spike of small greenish white flowers, at the top of a cylindrical stem of three feet in length. The magnifying glass, when applied to the flower, reveals its real beauty, every part of which is of a crystalline vesicular appearance. Similar to it, but blossoming when destitute of leaves, is the *Scilla maritima*, which, after more than two years careful cultivation, suddenly threw up a tall green stem supporting numerous small white flowers, the petals of which are completely recurved or bent backwards, the flowers in little clusters. It was brought to Salem from some part of Africa, and has been cultivated by F. Putnam, in his conservatory on Crombie street.

Some large fine looking bulbs of *Pancratum Illyricum?* have been liberally distributed by sale, at an extraordinarily low price per bulb. It is a native of the South of France and Spain; the flowers are white, handsome, and very fragrant.—J. L. R., *Salem.*

The Smallest Flowering-plant known.—Two weeks ago, returning from the Catskill Mountain House, I saw by the roadside, a mile west of Catskill Village, a pool completely *covered* with Wolffia. I hastily seized a newspaper (the only means of conveyance at hand), covered the sides with the minute grains, and keeping the paper wet, safely deposited it in my aquarium. This day (August 22d) I find it splendidly in *bloom*, the little white points dotting my aquarium. This is noteworthy, as being the first found in flower in this country, of this, the smallest flowering-plant known.

P. S.—At the same time are in bloom in my aquarium, *Lemna minor*, *L. perpusilla*, and *L. minor* var. *purpurea*, whose flowers differ so much from *L. minor*, that Mr. Leggett, who gave me these, will propose it as a distinct species.—T. F. Allen, M. D., *New York.*

PLANERA AQUATICA, THE PLANER-TREE. — Botanists of the South and South-west would confer a favor and benefit, if they would send to Professor Gray, of Cambridge, good specimens, in flower and fruit, of this rare tree; also, a stock of the fresh ripe fruit from which the tree may be raised. There are very few good specimens extant in the principal herbaria, and the tree is nearly or quite lost from cultivation, so far as we can learn, both in Europe and in this country. The monographer of the *Ulmacea*, for DeCandolles' Prodromus, particularly needs specimens at an early date. — A. GRAY.

VIOLA ROTUNDIFOLIA. — This plant was found in bloom April 23, in the vicinity of New Bedford, growing in mossy hummocks, in a rather dry, open place. The plant must be rare near the coast in this latitude, as it is not given in any of the local catalogues (Bigelow, Irving, Olney, Hitchcock, etc.) as occurring so near it. — H. W.

ZOÖLOGY.

HATCHING THE COTALPA LANIGERA. — Up to the time of writing the article on page 186 of the NATURALIST, we had not succeeded in getting the eggs of the Goldsmith Beetle. On the evening of the 13th June last, we caught in the drug-store, Keyport, whither they were attracted by the profusion of light, four Cotalpas, representing both sexes. These were taken home and well cared for. On the 16th a pair coupled. A jar of earth was at once provided, and the beetles placed on top of the dirt. In the evening the female burrowed and disappeared. Near midnight, she had not returned to the surface; next morning she had reappeared. The earth was then very carefully taken from the jar, and, as removed, was inspected with a glass of wide field but low power. Fourteen eggs were found; not laid (as we expected) in one spot, or group, but singly, and at different depths. I was surprised at their great size. Laid lengthwise, end touching end, two eggs measured very nearly $\frac{3}{16}$ of an inch. They were like white wax, semi-translucent; in form, long-ovoid, and perfectly symmetrical. On the 13th of July one had hatched; the grub was well formed and very lively. Its dimensions were about $\frac{5}{16}$ of an inch in length, and about $\frac{3}{40}$ of an inch in thickness. It was a dull white, the head-plate precisely that dull yellow seen in the adult grub, the legs the same color, and the extremity of the abdomen, lead-color, the skin being transparent. For food, a sod of white clover (*trifolium repens*) was given them, roots downward, knowing that the young larvæ would come upward to eat. They were then left undisturbed until August 19th, when the sod was removed, and it was found that the grubs had eaten into it, thus making little oval chambers, which were enlarged as the eating went on. They were carefully picked out, and a fresh sod of clover and grass supplied. They had now grown $\frac{5}{8}$ of an inch in length, preserving the same colors.

It is quite possible that a few of the eggs escaped me in the search. I

am of opinion, however, that from fifteen to twenty is the average number laid by one beetle; a number so small, that reckoning the ordinary casualties to which this not very active insect is exposed, it is not likely ever to become very formidable to the agriculturist. In short, the insect lays her eggs in the night, — probably not more than twenty. The hatching of these required, in the present instance, twenty-seven days. It must be remembered that a large portion of this time was remarkably cold and wet. It is almost certain that, with favorable thermal conditions, this might be lessened fully seven days.

These brief notes, added to the article on page 186, may be regarded as giving a degree of completeness to the history of the Goldsmith Beetle, as it is thus pursued from the egg to the imago. — S. Lockwood.

The Seventeen-year Cicada. — Seeing in the July number of the Naturalist a request for twigs of *oak* which had been stung by the so-called Seventeen-year Locust, I take the liberty of sending you twigs from *eleven* different varieties of trees in which the females have deposited their eggs. I do this to show that the insect seems indifferent as to the *kind* of wood made use of as a depository of her eggs. These were gathered July 1st, in about an hour's time, on the south hills of the "Great Chester Valley," Chester county, Pa. No doubt the number of trees and b ushes might be much increased. The female, in depositing her eggs, seems to prefer well-matured wood, rejecting the growing branch of this year, and using last year's wood, and frequently that of the year before, as some of the twigs enclosed will show. An orchard which I visited was so badly "stung," that the apple-trees will be seriously injured, and the peach-trees will hardly survive their treatment. Instinct did not seem to caution the animal against using improper depositories, as I found many cherry trees had been used by them, the gum exuding from the wounds, in that case, sealing the egg in beyond escape.

The males have begun to die, and are found in numbers under the trees; the females are yet busy with their peculiar office. The length of wood perforated on each branch varied from one to two and a half feet, averaging probably eighteen inches; these seemed to be the work of one insect on each twig, showing a wonderful fecundity.

The recurrence of three "Locust-years" is well remembered in this locality — '34, '57, '68. There has been no variation from the usual time, establishing the regularity of their periodical appearance. — William Kite, *West Town, Chester County, Pa.*

Museum Pests. — Every naturalist dreads the presence of the entomological rogues whose portraits are here exhibited. The ugly, bristly, insidious larva, which so carefully hides in the body of the dried insect or stuffed specimen it consumes, can be kept out only with the greatest precaution. The most injurious insect is the Larder-beetle, *Dermestes lardarius*. This beetle is nearly half an inch long, oblong-oval in shape, with short legs, and is black, with the base of the elytra covered by a broad gray-buff band. It is timid and slow in its movements, and when dis-

turbed, seeks a shelter or mimics death. Its larva is covered with hairs, the body ending in a pencil of them. The *Attagenus pellio* is a smaller black beetle, with two dots on the wing-covers. Its larva is slenderer and proportionally longer, while the reddish-brown hairs lie closer to the body, so as to make it glisten in the light. We have found the larva of an allied beetle, but nearly twice as large as that of *D. lardarius*, crawling up the side of an out-house.

Anthrenus museorum (Fig. 1; *a*, larva; *b*, pupa; much enlarged) is a smaller beetle, covered with transverse wavy bands of irregular spots. Its larva is short and thick, with long bristles, which are largest and thickest at the end of the body. The pupa transforms beneath the larva skin during the summer. Two or three other species are found in museums. Among them is *Ptinus fur*, which is figured on page 165 of the present volume of the NATURALIST, of which we here figure the larva (Fig. 2), which was found with the beetles in dead and dried snail-shells, in the Museum of the Peabody Academy. They may be killed like the Clothes-moth, also found in museums, by saturating the specimen attacked by them with benzine. To prevent their attacks, they should be kept out of collections by keeping benzine in constant evaporation in open vessels. Camphor and turpentine and creosote are also very useful. Zoölogical specimens recently prepared should be placed in quarantine, so we may be sure none of the museum pests will be introduced into the drawers or cases of the cabinet while either in the egg or larva state. Their presence in cabinets may be detected by the dust they make falling on the white surface beneath. Specimens thoroughly impregnated with carbolic acid, or arsenic, or corrosive sublimate, will not be attacked by them.

Fig. 1.

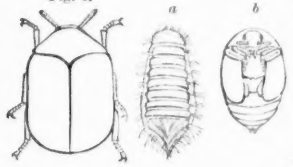

Fig. 2

GEOLOGY.

ANTIQUITY OF MAN.—In regard to the alleged discovery of human bones in the coral formation of Florida (see NATURALIST, Vol. II, p. 386), and which was first published by Professor Agassiz in Nott & Gliddon's "Types of Mankind" (eighth edition, p. 352), and has appeared in other works, including Lyell's "Antiquity of Man," we beg to give our readers the following statement in his own words, by Count L. F. Pourtales, the original discoverer of these bones: "The human jaw and other bones, found in Florida by myself in 1848, were not in a coral formation, but in a fresh-water sandstone on the shore of Lake Monroe, associated with fresh-water shells of species still living in the lake (*Paludina, Ampullaria, etc.*). No date can be assigned to the formation of that deposit, at least from present observation."

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. — NATURAL HISTORY SECTION. *Chicago, Ill., August* 5–12, 1868. In his paper "On the Geology of the Mississippi Delta, and the Rock-salt Deposit of Petite Anse," Professor E. W. HILGARD stated that this deposit was discovered in 1862, and the entire supply during the war, of the western half of the Confederate Government, was derived from this source. The deposit was, at least, thirty-eight feet thick, and extends over a surface of one hundred and forty-four acres, and is found in some places above the present sea-level. The salt was remarkably pure and free from gypsum, though the latter occurred fifteen miles distant.

In describing the geology of the delta, the author thought its progress seaward was not so much due to a deposit of sediment as to the upheaval of the bottom of the Gulf.

Professor W. P. BLAKE, of California, read an abstract of a paper "Upon the Gradual Desiccation of the Surface of the Western portion of North America." He called attention to some of the principal facts, leaving details to a future paper. The principal evidences of a gradual desiccation are found in the interior lake system of the Great Basin in Nevada, where the chain of lakes, between the Sierra Nevada and the Humboldt Mountains, the Truckee, Humboldt, and Carson Lakes, give unequivocal evidence of drying up. Formerly these lakes were united in one, so as to form a vast sheet of water, an inland sea which extended over many degrees of latitude and longitude. This lake has left ancient shores and beaches along the sides of the mountains, the former presence of the water being made known in some places by extensive deposits of travertin, which coats the rocks and hides them from view. The Great Salt Lake, also, gives evidence of a gradual wasting away. Its shores are bordered by broad regions of lacustrine deposits. The lakes of the valley of Mexico are also drying up, and there is evidence of change within the historic period. The Tulare lakes in California do not cover near as much surface as formerly, and an extensive region at the head of the California Gulf has dried up. In all the instances mentioned the water-lines and beaches are horizontal, and show that there has not been any local elevation or disturbance. Nor is it probable that any continental elevation has been instrumental in effecting the change. The cause appears to be cosmical.

Professor J. S. NEWBERRY, of New York, presented an abstract of a paper on "The Surface Geology of the Basin of the Great Lakes and the Upper Mississippi Valley." He hoped to give some information which would aid in working out the great problem of the drift. A map was drawn showing the region under discussion. The drift formation has been investigated most generally from the top downwards. This product of the glacial period in this region has not received sufficient attention.

There was an intimate relation between the features described by General Warren and the phenomena now to be noticed. Bowlders are found 500 miles from their native rocks. The valleys of the rivers were excavated by the glaciers to a depth far below their present level. Sometimes shafts are sunk 150 feet before these rock-beds are reached. There was, doubtless, once a river-connection between Lakes Erie and Ontario. Lake Erie was formerly only a river—the ancient river-beds in the vicinity being from 100 to 150 feet below the present level of the streams. At Louisville there was an apparent exception, as there were rock bottoms in the river, but the city occupies the site of the ancient river-bed. Sometimes there are two bluff formations of different ages. All this clearly indicates that formerly the country was more perfectly drained, that is, that the continent was more elevated. When these valleys were excavated, the drainage was free to the ocean, similar to the condition in California; and the rivers, by their great erosion, wore away the hard rocks. The origin of the Niagara and Hudson Rivers was evidently glacial. The ancient beds of the rivers on the Pacific Coast were far below their present level, showing great land elevation. It is not certain that the continental elevation was sufficient to afford a temperature essential to the formation of the glaciers, which were afterwards melted and left the material of the drift. The glaciers were not unbroken.

In his paper "On the Geological Age and Equivalents of the Marshall Group," Professor A. Winchell stated that this term was employed as a general designation of the rocks known as "Waverly Group," in Ohio, "Rockford beds," in Indiana, "Kinderhook Group," in Illinois, "Yellow Sandstones," in Iowa, and "Chonteau Limestone" series, in Missouri. It was the object of the paper to prove, first, that these local groups are geologically equivalent; second, that they are the western representatives of the Catskill group, of New York. As accessory considerations it was shown, first, that they are characterized by a carboniferous fauna; second, that this fauna is totally distinct from that of the Portage and Chemung; third, that the Huron group, underlying the Marshall, answers to the Portage and Chemung; fourth, that there are certain conglomerates in Western New York which seem to connect the Western Marshall with the Eastern Catskill group, and thus establish their contemporaneous origin. The subject was discussed in two papers: I. Stratigraphical Considerations; II. Palæontological Considerations.

Professor WHITNEY, State Geologist of California, exhibited the human skull said to have been obtained at the depth of 130 feet below the surface, in Calaveras county, California, and read a long paper on the subject of the fresh-water tertiary, and the later detrital and volcanic formation of that State. He gave a minutely detailed account of the circumstances attending the finding of the skull, as given by Messrs. Matteson & Scribner, of Angel's Camp, and Dr. Thomas Jones, of Murphey's. Professor Whitney stated, that he had visited the locality several times, and had found no reason to doubt the good faith of the parties testifying to the

genuineness of the discovery. The bottom of the shaft, however, he had been unable to examine, owing to the presence of water, which could not be removed without considerable expense. This will be done at a future time, and a full report of the evidence obtained will be laid before the public. A careful survey of the whole region, adjacent to the locality where the skull was found, has been made, and a map, on a large scale, has been made, which is now on its way from California, and which was expected to arrive in time to be exhibited at this meeting, but which has been delayed by some accident. The evidence in regard to the authenticity of the skull was laid before the Association, in order that every one might judge for himself as to its fulness and reliability. An anatomical description of the skull, and the bones found associated with it, by Professor J. Wyman, was incorporated in this paper, from which it appeared that it was very closely related in its character to that of the crania of the present California Indians, and that where it differed from them, it approached the Esquimaux type.

Professor Whitney remarked he could not guarantee the authenticity of the discovery, but could only state that the skull had been placed in his hands by gentlemen known to himself as men of veracity, and that his own examinations and those of his assistants, after repeated visits to the parties concerned, and the region in which the discovery was made, had failed to reveal any flaw in the testimony, or any motive for deceit on their part; on the contrary, there were several additional links in the chain of circumstantial evidence which were clearly made out by a comparison of the condition of the skull, as it appeared when it came into his hand, with the statements of Messrs. Matteson & Scribner as to the locality in which it was found.

Professor Whitney insisted most strongly that, apart from anything connected with this skull, the labors of the Survey had clearly demonstrated the fact, that man, and the mastodon, and elephant, had been contemporaneous in California.*

The portion of Professor Whitney's paper relating to the skull, was followed by an abstract of the discoveries of the Geological Survey of California, relating to the animals and plants found in the fresh-water tertiary of that State, and the probable geological age of the different members of this formation, with especial reference to that of the beds in

* Mr. S. H. Scudder, Custodian of the Boston Society of Natural History, has called our attention to a specimen, interesting in this connection, presented to the Museum of the Society, accompanied by a label of which we made the following copy: "Fossil Human skull. From a shaft in Table Mountain, California, found 180 feet below the surface, in gold drift, among rolled stones, and near mastodon debris. Overlying strata of basaltic compactness and hardness. Found, July, 1857. From C. F. Winslow, M. D., September 10, 1857."

"Hon. Paul K. Hubbs, State Supt. of Public Instruction, Benicia, California, to Dr. Winslow, August, 1857."

The specimen is a fragment a little over an inch long, and about one-third as broad, and evidently a portion of one of the tabular bones of a skull.—Eds.

which the skull is supposed to have been discovered. Of this portion of his paper, Professor Whitney promises an abstract in time for the next number of the NATURALIST.

THE NATIONAL ACADEMY OF SCIENCE began its August meeting at Northampton, Mass., on the 25th, and remained in session four days; twenty-five members being present. We extract from the daily press a list of the papers read on Natural History.

Professor J. D. Whitney read an account of the "Origin of Bitumens, and of Experiments upon the Formation of Asphaltum;" and papers "On Topography and Topographical Work west of the 103d Meridian;" "On the Discovery of the Human Skull in Calaveras County, California," and "Some Points in the Surface Geology of the Rocky Mountains."

Mr. L. F. Pourtales read a paper on "Deep-sea Dredging in the Gulf Stream," and Mr. W. M. Gabb one on the "Cretaceous and Tertiary Formations in California."

Professor W. H. Brewer made a communication "On the Distribution of Fresh Vegetation west of the Rocky Mountains;" and Professor O. C. Marsh one "On the reputed Discovery of Human Bones at Antelope Station, Pacific Railroad."

Professor G. N. Brush read a paper on "A New Borate from Mine Hill, Sussex County, N. J.;" and Professor J. S. Newberry papers on "The Transportation of the Material of the Carboniferous Conglomerate," and "The Circle of Deposition in Sedimentary Rocks;" and Professor J. P. Lesley read a paper on "Lake Formation."

ANSWERS TO CORRESPONDENTS.

H. H. B., Chicago, Ill.—The small insects you send belong to an unknown species of Podura, or Springtail, which are minute, wingless neuropterous insects with spines at the end of the body, modified into a leaping apparatus. We would be much obliged for specimens in alcohol of these minute insects, of which little or nothing definite is known in this country. We insert a figure of a Springtail, greatly magnified (Fig. 1), belonging to the genus Machilis. The Springtails are found about manure and refuse heaps, in cellars, under stones and sticks in moist places. You write us that the species found by you (which is related to the *Podura nivicola* of Dr. Fitch, which has been found on the snow, and which occurs abundantly under the bark of trees in early spring with us) "made its appearance in large quantities after the heavy rains. They are scattered throughout the drains in immense quantities, in colonies of from four to twelve inches in diameter. When grouped in such immense quantities, they are of a very dark green color." They use the "spring" almost entirely to hop with.

Fig. 1.

J. G. H., Philadelphia.—Your article was received and promptly acknowledged, but the letter was returned, not having been called for. We will print the article soon, and illustrate it. Many thanks.

E. L., Brighton, Md.—We will answer your queries about the House-fly in a forthcoming article on the Flies, to be illustrated. Flies do not grow after leaving the pupa state. The myriads of flies, little and big, we see through the summer, belong to different *species*, of which there are several thousand in this country. The Seventeen-year Locust is not known to sting; there is a bare possibility that it may insert its beak into the flesh if held between the fingers, as some other "bugs," or hemipterous insects (such as the bed-bug) are known to do.

G. E. S., Homestead, Mich.—We dare not risk naming the fish from your description. Can you not send the skull? We have ordered the book for you from London.

J. W. S., Cromwell, Conn.—The insect you send is the *Ploiaria brevipennis* of Say, a remarkable hemipterous insect, common in the Middle States, but not frequent in New England.

O. N. B., Pomonkey, Md.—We never heard of a Dragon-fly depositing its eggs on its breast. The Libellulidæ are very fully described in Dr. Hagen's Synopsis of the Neuroptera of North America, which can be purchased by applying to B. Westermann & Co., 440 Broadway, New York. We cannot tell what the insect is to which you refer in your postscript without a specimen before us.

W. S., London, Canada.—The insect which you say deposits its eggs in the raspberry stems, is the *Œcanthus niveus*, or tree-cricket.

C. C. C., Lookout Mountain, Tenn.—Any one residing in the Southern States will do us a great favor by sending specimens of "bugs" and insects of all sorts. We want very much insects injurious to the Cotton-plant, especially the caterpillar, chrysalis and moth of the army-worm. Will write you more at length.

W. C. F., Sandwich, Mass.—The insects came safely. The large beetle is probably the *Pasimachus obsoletus* of Le Conte.

S. S. C., Fall River.—The plant is *Marchantia polymorpha* L.

R. A., Fond du Lac, Wis.—The worm you sent was the larva of a fly, *Scenopinus*. We shall have more to say about it in a subsequent number of the NATURALIST. The small "white mites" you found so thick in the flower-pots are, probably, "Spring-tails." We know of no jumping-mite.

A. P., Hudson, Ohio.—You may be able to obtain cocoons of the Cynthia Silk-worm from Mr. W. V. Andrews, 264 Third Avenue, New York city.

L. W. B.—Try a solution of two parts of carbolic acid to one hundred of water, and syringe your plants with it. You must proceed carefully so as not to injure the hot-house plants.

S. B., Garrettsville, Ohio.—The shell-like objects you sent are the cases made of grains of sand by the larva of a Caddis-fly. We will give a farther account of them hereafter. Try to obtain the larvæ and flies, as the adult state is not known.

J. B., Haverhill, Mass.—The insects sent belong to a species of *Psocus*, which lives on the bark of trees, often eating lichens; they often occur in great numbers.

F. N. O., New York.—The glass sides of the case, containing the insect you enclosed, broke, and the specimen was unfortunately lost. The best way to send any but the largest insects is to cut or punch a hole through a strip of cork, and then tie on a pasteboard cover over the holes. In this way the insect will travel safely, and will cost no additional postage.

J. B., Portsmouth, R. I.—The insects are the male and female of *Strategus Antæus*, a large Lamellicorn beetle.

M. C. R., Hudson, O.—The insects came safely. Please try to raise the worms yourself also.

W. H. L., Clyde, N. Y.—The moth is the *Eudryas grata*.

L. M., Norwich, Conn.—The sample of the so-called Swamp-apple, found on the wild Azalia, was mislaid in some way, and we do not remember seeing it. The caterpillar found on the Common Creeper, *Ampelopsis quinquefolia*, is the larva of *Eudryas grata*. The fact that just before turning to a pupa, it bores into wood buried beneath the surface of the ground, is new and exceedingly interesting to us, as we have long contended that Eudryas is closely related to Castnia, which bores in the stem of plants in the tropics, and is not allied to *Notodonta*, one of the Silk-worm family.

BOOKS RECEIVED.

Land and Water. April 25, May 2, 9, 16, 23, 30, June 6, 13, 20, 27, July 4, 11, 18, 25, August 1. London.

The Quarterly Journal of Science. July. London.

Cosmos. June 13, 20, 27, August 1, 8. Paris.

The Field. June 27; July 4, 18; August 1, 8. 15. London.

American Bee Journal. July, August, September. Washington.

Chemical News. July. New York.

American Cervus. By Hon. John D. Caton. Ottawa, Ill., 1868. 8vo, pp. 43.

The Percheron Horse: translated from the French of Charles du Huys. New York, 1868. Orange Judd & Co. 12mo, pp. 100, illustrated.

The Past and Future of our Planet. By William Denton. Boston, 1868. 8vo.

Journal of Travel and Natural History. Edited by Andrew Murray. Vol. I, Nos. 1-3. London, 1868.

Transactions of the American Entomological Society. Vol. II, No. 1. 8vo, illustrated.

Queries on the Red Sandstone of Vermont. By Rev. J. B. Perry. Boston, 1868. 8vo, pp. 15.